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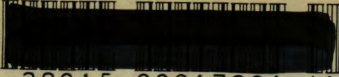
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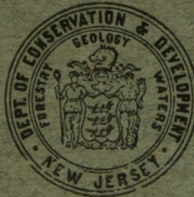
DEPARTMENT OF CONSERVATION AND DEVELOPMENT
STATE OF NEW JERSEY

ANNUAL REPORT

For the Year Ending October 31,
1916

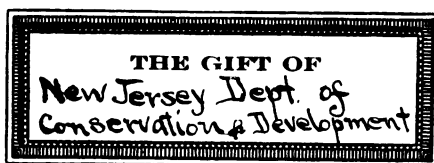
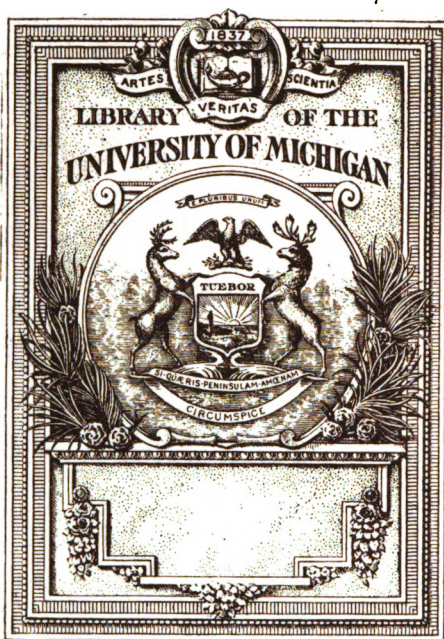
Department of Conservation and Development

SUCCEEDING
THE GEOLOGICAL SURVEY
THE FOREST PARK RESERVATION COMMISSION
THE STATE MUSEUM COMMISSION
THE STATE WATER-SUPPLY COMMISSION
THE WASHINGTON CROSSING PARK COMMISSION
THE FORT NONSENSE PARK COMMISSION



TRENTON, N. J.
MACCRELLISH & QUIGLEY Co., State Printers

1917



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1916

THE WRONG METHOD OF BURNING BRUSH
A LARGE AND VERY HOT FIRE



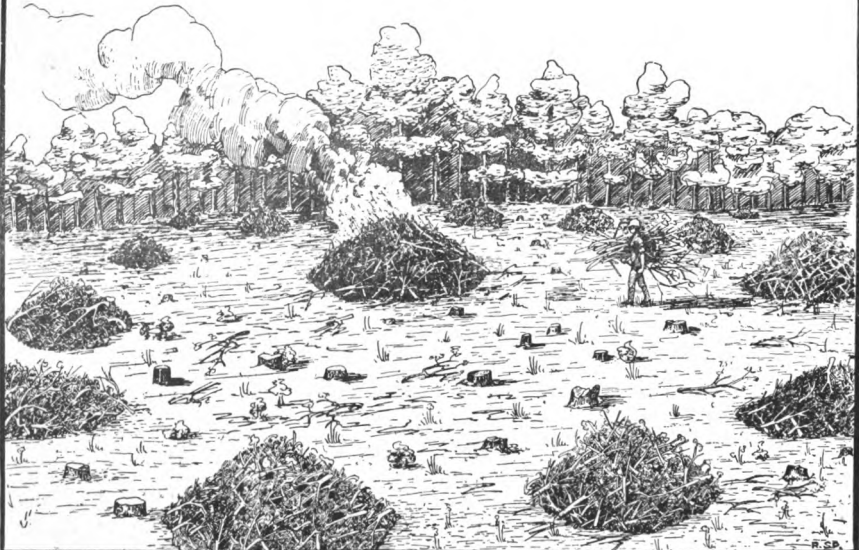
THE WRONG METHOD OF BURNING BRUSH
BRUSH PILED IN LONG WINROWS



THE WRONG METHOD OF BURNING
BRUSH
NUMEROUS PILES ALL FIRED AT ONCE



THE RIGHT WAY TO BURN BRUSH
ONE SMALL FIRE TO EACH MAN, REPLENISHED AS IT
BURNS DOWN



**Careless or Ignorant Brush Burning Annually Causes Ten Per Cent.
of New Jersey's Forest Fires.**

REPORTS OF THE
DEPARTMENT OF CONSERVATION AND DEVELOPMENT
STATE OF NEW JERSEY

ANNUAL REPORT

For the Year Ending October 31,
1916



Department of
Conservation and Development

SUCCEEDING
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THE WASHINGTON CROSSING PARK COMMISSION
THE FORT NONSENSE PARK COMMISSION



TRENTON, N. J.
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1917

The Board of Conservation and Development.

WALTER J. BUZZY, <i>President</i> ,	Atlantic City
SIMON P. NORTHROP,	Newark
EDWARD S. SAVAGE,	Rahway
CHARLES L. PACK,	Lakewood
GEORGE A. STEELE,	Eatontown
NELSON B. GASKILL,	Trenton
STEPHEN PFEIL,	Camden
HENRY CROFUT WHITE,	North Plainfield

ALFRED GASKILL, Lawrenceville,	<i>State Forester and Director</i>
HENRY B. KÜMMEL, Trenton,	<i>State Geologist</i>
CHARLES P. WILBER, New Brunswick,	<i>State Firewarden</i>

OFFICE, STATE HOUSE, TRENTON.

W. B. Whit. Co. v. J. H. Whit. Co. 7-13-17g

W. B. Whit. Co. v. J. H. Whit. Co. 7-13-17g

W. B. Whit. Co. v. J. H. Whit. Co. 7-13-17g

W. B. Whit. Co. v. J. H. Whit. Co. 7-13-17g

B. G. Webb. Conservation & Development 7-18-17g

B. G. Webb. Conservation & Development 7-18-17g

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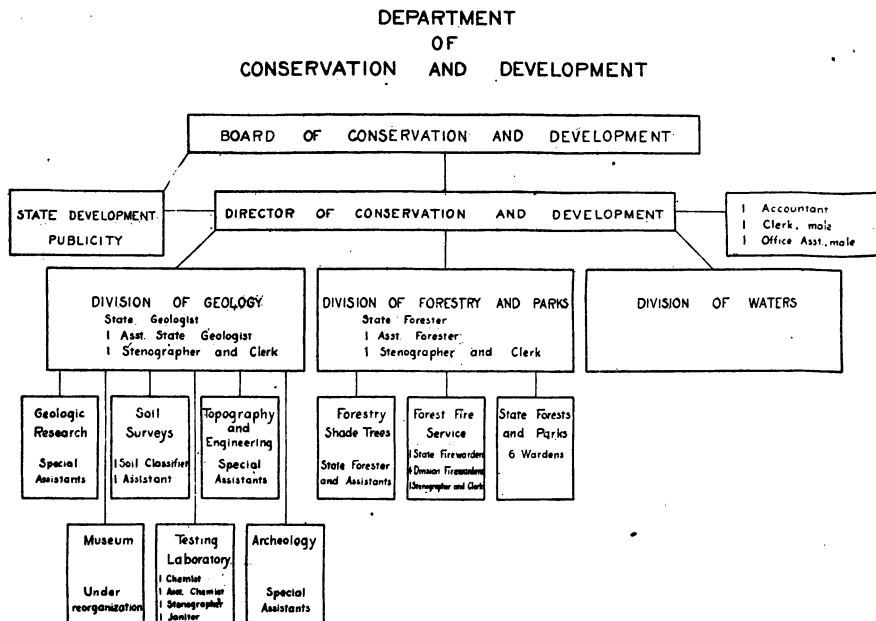
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Report of the Board of Conservation and Development.

ORGANIZATION.

During the year there have been no changes in the plan of organization of the Department except that made necessary by taking over on July 1, 1916, the duties of the State Water-Supply Commission. The Board, after full consideration of the new work, created a Division of Geology and Waters, under the direction of Henry B. Kummel, State Geologist, as Chief, instead of maintaining separate divisions for Geology and for Water Resources as had at first been contemplated. The position of Water Engineer was created, and those of Consulting Engineer and of Assistant Engineer abolished. The organization of the Department is shown by the accompanying diagram.



WORK OF THE DEPARTMENT.

The functions of the Board are manifold. As successor to the Geological Survey, it is charged with the investigation of all the mineral resources of the State, including water; with the preparation and publication of topographic, geologic, and other maps; with soil classification and mapping; with the maintenance of a chemical and testing laboratory, both for the furtherance of its own researches and for testing material for other departments, notably the Department of Public Roads and the State Purchasing Agent; with special engineering investigations as from time to time required by the Legislature. As successor to the Forest Park Reservation Commission and several other boards, it fosters the practice of scientific forestry by private land owners; administers the State forest reserves with a view to their development as revenue producers and as public parks; prevents forest fires on both public and private forests; encourages the planting and care of shade trees; has charge of Swartswood Lake in Sussex County and of the Washington Crossing Park, near Trenton. From the State Water-Supply Commission it received jurisdiction over the distribution and diversion of all potable water supplies, both surface and sub-surface; is charged with responsibility for the safety of dams and their proper construction; may gauge streams and investigate water powers. As successor to the State Museum Commission, it is charged with the development and maintenance of a museum, which shall be a credit to the State and an instrument in its development along material, educational and artistic lines. In addition to these duties it is invested "with full control and direction of all State conservation and development projects, and of all work in any way related thereto, except such as is conferred upon other boards."

The progress which has been made during the year in the performance of these duties is set forth in the reports of the State Geologist, State Forester, and State Firewarden, which accompany and are a part of this report.

In addition to the activities therein set forth, attention may be directed to two other phases of the Board's activity. In carrying out its plan of making public in a wider degree than heretofore the advantages of New Jersey as a place of residence and business, the Board recommended, and the Governor appointed, May 12 as New Jersey day, at which time appropriate meetings were held by many schools, by clubs, and by commercial organizations, all designed better to acquaint the people of New Jersey with their State, its history, resources, and advantages. In furtherance of this plan the Board prepared and distributed widely a circular entitled "New Jersey Invites You," from which a few paragraphs may be quoted:

1. *The center* of the densest organized population on earth lies in New Jersey. More than ten million people live within 60 miles of the State House at Trenton.

2. *The Home State.* To no other State do so many people with interests elsewhere come to make their homes. The popularity of our suburban communities is based upon accessibility, good air, good water, good schools, good living conditions.

3. *The resorts* of New Jersey attract more visitors than those of any other State. The entire coast from Sandy Hook to Cape May, a reach of 125 miles, is the chief summer playground of the country. Some of these seaside cities have a world-wide reputation. It is less well-known that there are also numerous quiet communities, and ample room for many times the number of visitors now provided for. About the lakes and on the hills of Morris, Passaic and Sussex counties are resorts of quite another character. Less well-known than those along the coast they attract people who love the hills, the woods and the quiet waters. In the pines of Burlington, Monmouth and Ocean counties is still another class of resorts, most attractive in the winter.

4. *The cities and towns* of New Jersey have grown more rapidly than those of any other eastern State. This is good in that it proves the attractions that are offered; it is harmful in that too large a part of the population lives under congested conditions.

5. *In manufacturing* New Jersey ranks second among the States in the per capita value of manufactured goods and sixth in the aggregate value of such products. The capital invested in the State is nearly twice as much as was invested in the whole United States in 1850. The variety of manufactures is great.

6. *The farms* of New Jersey are feeding the nearby multitude in increasing measure; their product in fruits, vegetables, poultry and milk is of the highest quality, yet farm land is cheaper than it is in many States having less favorable conditions.

The conditions which determine New Jersey's preëminent advantages are:

1. *Its location* at the heart of the Nation's greatest activity. Its nearness to the best markets; to the greatest supplies of fuel, and to the distribution points of raw materials of manufacture—metals, lumber, clay, wool, leather, etc.

2. *Its water front.* Nine-tenths of the State is water bounded; shipping of every class finds ample dockage in the great harbors of New York and Philadelphia, in the many lesser bays, or along its rivers. Behind the coast beaches is a safe waterway ninety miles long navigable by small vessels.

3. *The climate* of the whole State is moderate. In the hills of the north the summers are extremely pleasant, the winters often snow-bound. In the south snow lies but a short time, and the summers are freshened by the ocean and by the large area of forest. There are few seasons of excessive heat or excessive cold anywhere, and drouth is rare. The rainfall averages nearly four inches a month throughout the year.

4. *The soils* of the State vary from light, warm sands suitable for trucking to heavy loams for grain and roots, and stony slopes for tree fruits and pasture. In the central and southern sections tillage involves a minimum of labor.

5. *Transportation* is highly developed. Suburban sections are well served by steam roads, electric roads and highways. The State contains one mile of railroad (first track) to every three square miles of land and an extensive system of country roads. New Jersey was the first State in the Union to adopt the State-aid plan of road construction. It now has 7,344 miles of im-

: : :

proved roads. Of this 5,112 miles are country roads and 2,232 miles are in municipalities. The regular State appropriation for road construction (additional to county and township appropriations) is \$500,000 per year. The motor vehicle receipts available for road repairs are approximately \$1,000,000 a year.

6. *The school system* ranks among the highest in the country. Modern school buildings, well equipped for all phases of school work, are provided for the children of the State. Continued progress is being made along this line. The entire school system is under the direction of an efficient State Department of Education, assisted by a corps of county and city superintendents and supervising principals. Enthusiastic teachers are utilizing all means available to make the school work practical. During the school year 1914-15 there were 14,771 teachers in New Jersey schools; the total enrollment was 563,240; the total expenditure upwards of \$17,000,000, and the expenditure per pupil, based on attendance, \$41.96. There are 156 high schools in the State. The school property is valued at \$65,000,000.

7. *Nearly half the State is forested*, an assurance of agreeable living conditions. What are called pine barrens in South Jersey are not barren nor worthless, as is so often asserted, but areas which have been brought to a degraded condition by forest fires. This evil is steadily being brought under control. Much of the forest now growing on relatively good soil should give way to new people. New Jersey as a whole is densely populous; in spots it cries for more citizens.

8. *Fisheries.* The present, or the potential, value of the coast waters in supplying food is little appreciated. From not over two-fifths the area available for oyster and clam culture is produced annually upwards of five million dollars' worth of shell-fish. The value of other food fish taken in our waters is estimated at three millions more.

Farming.

New Jersey's strongest appeal at this time is to those who are looking toward the land for a living. Every section is in closest touch with city populations—essentially consuming

populations, whose prime needs are the products of the soil. Why go West or South or to Canada when the opportunity lies within 50 miles of New York or Philadelphia?

Our soils are of many kinds and adaptable to the widest range of crops. Under intensive culture some of this land is yielding in fruits and vegetables satisfactory returns on a valuation of \$1,000 an acre. The average annual yield of our farms is \$22.57 per improved acre; the farms of Iowa yield but \$10.66 per improved acre. There are within the State available for immediate development *a million acres of land* as good as that now under intensive cultivation. Three hundred and fifty thousand acres of the best grain and fruit land occupy the valleys and hillsides of Hunterdon, Morris, Passaic, Somerset, Sussex and Warren counties. Six hundred and fifty thousand acres lie in the southern half of the State, where the soil is light and easily worked and the growing season long.

Nowhere need the farmer live in a wilderness. Few farms are more than two miles from an improved highroad, or more than five miles from a railroad station. Telephone and daily mail reach every section. Schools, churches, stores, are never far off. *A family can live while making a living*, and can get instruction and help from the State Agricultural College and from two Agricultural Experiment Stations.

All these lands are in private possession. The State owns none. Run-down farms with buildings can be bought for \$40 an acre, or even less; cleared land without buildings for as little as \$20 an acre; uncleared or brush land, but the soil fit for many kinds of crops, for from \$5 to \$20 an acre. Some of the most successful orchards, berry and vegetable farms have been developed on this type of land. These prices seem ridiculously low in comparison with those that obtain in favored farming sections; they represent not inherent worthlessness, but an economic error.

Mosquitoes.

To aid the work being done by the State Entomologist and by the several County Mosquito Extermination Commissions, this Board issued and distributed 10,000 copies of a pamphlet emphasizing the practicability of mosquito-control work, the success which has attended the work already done, and the value to the State to complete the control and elimination of the salt-marsh mosquito. The Board of Conservation and Development endorses in the strongest terms the work which has already been done, and urges without qualification the importance of carrying it to an early completion.

Publicity.

Recognizing the fact that a vigorous publicity campaign must be of advantage to the State's development, the Board has formulated plans whereby the State and its resources will be advertised at home and abroad through the press, by attractive publications, and by lectures and exhibits. Coöperation is being sought with schools, boards of trade, railroads, and other organizations with the purpose of carrying the work from general publicity to specific propositions. In the development of this phase of its work the Board has been restricted by lack of sufficient funds. The work can be broadened in proportion to the amount of money available.

The Board regrets to record the fact that owing to ill health, the result of overwork, Mr. Alfred Gaskill, the Director of Conservation and Development, was early in September forced to request leave of absence, which was granted.

Respectfully submitted,

BOARD OF CONSERVATION AND DEVELOPMENT,

by HENRY B. KÜMMEL, *Acting Director.*

CASH RECEIPTS AND DISBURSEMENTS.

Receipts.

Balance on hand November, 1915,	\$204.56
Receipts from sales of Geologic maps and reports,	1,185.44
Receipts from analyses made at Testing Laboratory,	114.00
Receipts from American Express Co. for maps lost in shipping, ..	25.00
Receipts from certified copies of records,	13.75
Receipts from sales of Forestry reports,	16.00
Receipts from sale of Mays Landing Forest Reserve,	8,264.00
Receipts from products of Forest Reserves,	53.00
Receipts from rent of house (Washington Crossing Park) and sale of old building materials,	332.50
Receipts from expenses of Foresters in coöperative work,	13.80
Receipts from settlements with Sundry Violators of Forest Fire Law,	1,724.57
	<hr/>
	\$11,946.62

Disbursements.

Paid to State Treasurer,	\$2,037.00
Paid to Sundry Township Treasurers,	1,385.59
Balance on hand October 31, 1916:	
Due State Treasurer,	\$8,491.53
Due Township Treasurers,	32.50
	<hr/>
	8,524.03
	<hr/>
	\$11,946.62

Report of the State Geologist.

HENRY B. KÜMMEL.

ADMINISTRATION.

Scope of Report.—This report covers the administrative work of the Division of Geology and Waters. The results of the scientific work of the Division are separately published as maps, bulletins, and final reports.

Organization.—From the beginning of the fiscal year to July 1, 1916, the Division of Geology comprised the Geological Survey, including the Testing Laboratory and the State Museum. On July 1, the Board of Conservation and Development assumed many of the duties of the State Water-Supply Commission. Instead, however, of establishing a Division of Waters, the work of this branch was placed under the direction of the State Geologist, and the name of the Division changed to "Geology and Waters." The positions of Consulting Engineer and Assistant Engineer under the old State Water-Supply Commission were abolished, and that of Water Engineer created, but to the end of the year no appointment had been made, W. H. Boardman, former Assistant Engineer of the State Water-Supply Commission, being retained, and acting in an advisory capacity.

The scientific staff of the Division has been as follows:

Henry B. Kümmel, State Geologist and Chief of Division.

M. W. Twitchell, Assistant State Geologist.

R. B. Gage, Chemist.

C. C. Engle, Soil Survey Expert.

Linwood L. Lee, Soil Survey Expert.

Helen C. Perry, Museum Organizer.

W. H. Boardman, Assistant Engineer.

C. C. Vermeule, Topographer and Consulting Engineer.

J. Volney Lewis, Geologist.

S. M. Sharkey, Clay Expert.

H. M. Miller, Soil Survey Assistant.

In addition to these, several of Mr. Vermeule's assistants were employed from time to time, either in the field or in the office, on revision of topographic maps, running lines of levels, and on engineering work at Shark River Inlet.

Publications.—The following publications were issued during the year:

Bulletin 17. Revision of Primary Levels and List of Bench Marks in Northern New Jersey, by C. C. Vermeule, Consulting Engineer.

New editions of the Dover, Plainfield and Shark River Topographic Atlas sheets, scale, 2,000 feet = 1 inch.

New editions of Topographic Atlas sheets Nos. 22, 23 and 26, scale, 1 mile = 1 inch.

Road Map of New Jersey, scale, 4 miles = 1 inch.

Distribution.—The sale of maps for the year, with comparative figures for the two years preceding, are shown in the following table:

	<i>Sheets Sold.</i>		
	1914.	1915.	1916.
Maps on scale of 1 mile per inch,	1,472	1,570	1,685
Maps on scale of 2,000 feet per inch,	1,585	1,195	1,803.
Geologic folios,	101	116	115
Geologic map of New Jersey,	253	154	119
County and Municipality map of New Jersey, .....	....	....	344
Railroad map of New Jersey, .....	....	....	158
Road map of New Jersey, .....	....	....	714

Expenditures.—The receipts and expenditures of the Division are included in the figures for the Department, page 14.

TOPOGRAPHY AND ENGINEERING.

Bench marks.—Considerable office work was done in the early part of the year by Mr. Vermeule and his assistants in computing results of the field work which had just been completed, and in the preparation of the manuscript report later published as Bulletin 17 (Geologic Series). In October it was



Fig. 1. Looking Across the Inlet, September, 1915, to the Avon Shore. Remains of the Concrete Piling Undermined by the Current; Old Wooden Jetty at Right.

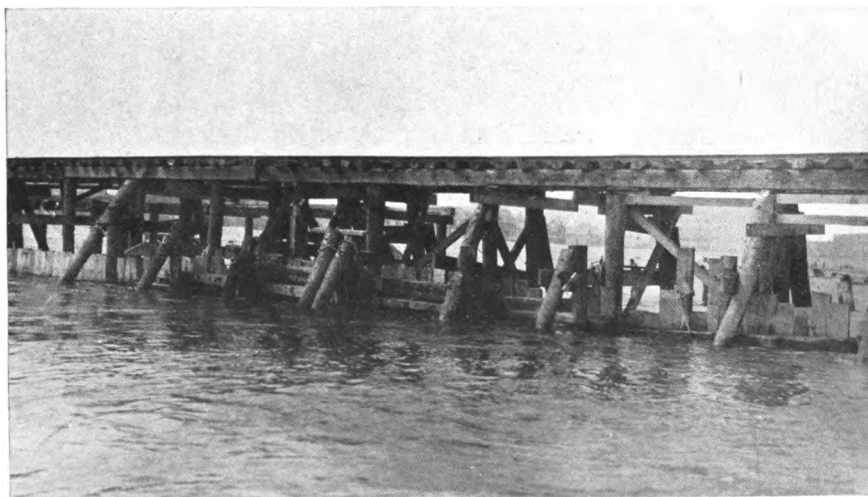


Fig. 2. Railroad Trestle Built Across the Inlet and a Portion of the 300-foot Temporary Dam of Sheet Piling, Driven to Divert the Current.

found possible to provide funds for a continuation of this work in Mercer and Middlesex counties, and a field party was organized by Mr. Vermeule, Loren P. Plummer, Jr., in charge, and from October 17 to 31 about 48.5 miles of levels had been run and 92 bench marks established. A line was run from Perth Amboy through Hightstown to Bordentown, and a line from Monmouth Junction through Jamesburg to Tennent.

It is the expectation that during the field season of 1917 the United States Coast and Geodetic Survey will coöperate with this Department by extending a line of levels from Sandy Hook southward along the coast.

Shark River Inlet.—As stated in the last annual report, the company having the contract for the construction of jetties there became bankrupt in August, 1915, and after some legal delays the completion of this improvement was taken over by the Department of Conservation and Development under the general supervision of C. C. Vermeule, the Engineer in charge.

Prior to this a considerable portion of the unfinished western end of the north jetty had been undermined by the current running through the inlet, and many of the concrete piles fell over, and were afterward deeply buried in sand when shifting of the inlet diverted the current (Fig. 1). These buried piles lay directly in the line of the westward extension of the jetty, and had to be removed before new piles could be driven. This was one of the difficulties immediately encountered. As soon as the equipment at hand could be supplemented to provide adequately for the effective carrying on of the work, which could not be done until after the first of the year, the south jetty was completed by the addition of the cap and brace beams, and efforts were made to remove the buried piles and extend the north jetty westward from the beach. It was possible to remove some of the piles after dynamiting them, but progress was extremely slow. About February 1 the course of the inlet changed slightly and threatened to undermine the new work, as it had that of the contractor. An attempt to open the inlet on the south side of the jetty by the use of horses and scrapers proved unsuccessful. It was then determined to extend the rail-

road trestle across the inlet to the west side, to bolt waling pieces against the wooden piles of the trestle, and to drive 300 feet or more of wooden sheet piling (Fig. 2) in such manner as first to protect the concrete piling from further scour, and eventually to shut off the inlet; then to open a new inlet in its proper place on the south side of the jetty. This was finally accomplished, although rapid progress could not be made during the winter months owing to weather conditions and ice on the trestles (Fig. 3). As the gap was gradually narrowed the velocity of the current greatly increased. The first effect was to make it impossible to work except at slack tide; a second effect was to scour away the sand which covered the fallen piles so that with the aid of a diver they could be pulled out. These were finally removed, the gap closed, and the new inlet opened across the beach about May 25, 1916. The new inlet increased rapidly in depth and width, and soon became permanently established (Fig. 4). From about June 1 construction work was carried on with increasing rapidity until near the end of September, when the funds available, including a supplemental appropriation of \$25,000, were so far depleted as to compel the Board to consider the discontinuance of all work. At this time there remained to be completed about 251 feet at the west end of the jetty and about 200 feet at the east end. It was possible to continue work during October and to complete the west end of the jetty early in November through the financial aid rendered by the Boroughs of Belmar and Avon.

Physical difficulties have not been the only obstacles which the Department has had to overcome in carrying on this work. The order of the United States District Court, which turned over to it the plant of the bankrupt contractor, contained a stipulation that the question of rental, at a possible maximum of \$500 per month, should be a matter of future adjudication. Immediately after possession was taken the Attorney-General was requested to proceed at once to have this determined, but no progress was made until early in August, when a hearing was held before a special master. After several postponements a second hearing was held in October. At the close of the year

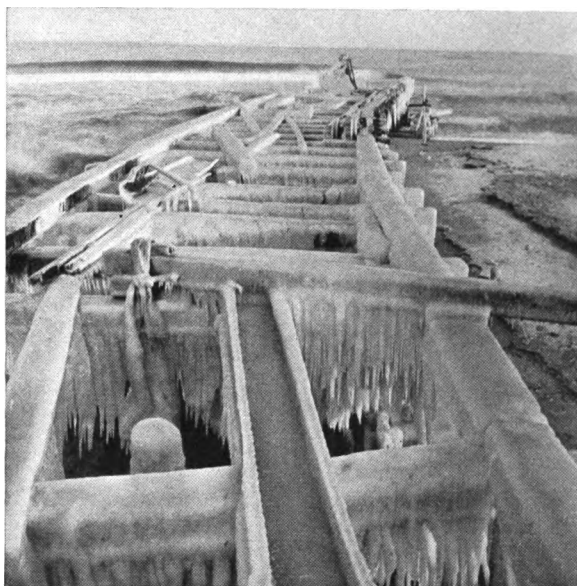


Fig. 3. Ice on the Seaward End of the North Jetty, Showing Conditions Which Retarded Work During the Winter, 1915-1916.



Fig. 4. Inlet After Opening on the South Side of the Avon Jetty. On Completion of the Work the Railroad Track and Trestle Will be Removed.

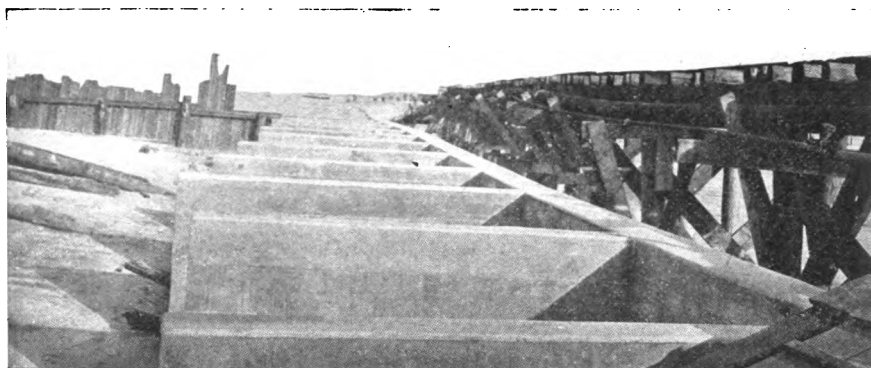


Fig. 5. Completed Middle Part of Jetty on the Avon Side, Looking Seaward. Railroad Trestle Will be Removed.

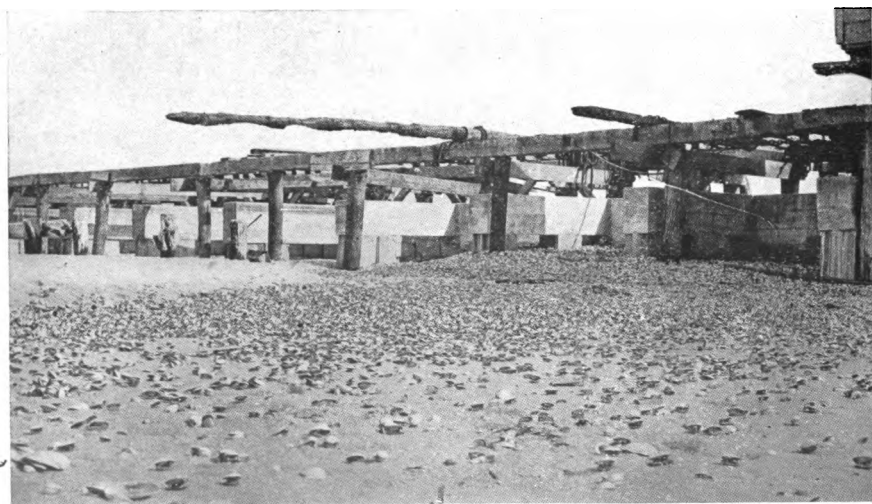


Fig. 6. Sand Fill Accumulated on the North Side of the Avon Jetty; Water was 6-10 Feet Deep Here When Jetty was Built.

the matter was still unsettled. The effect of this delay has been to compel the setting aside from the appropriation of a sum sufficiently large to meet this contingent liability. A prompt decision of this question in favor of the Department early in the year would have released this sum, which is urgently needed to complete the work. The results accomplished, however, are substantial (Fig. 5). Of the north jetty there remains to be completed 200 feet at its seaward end. The south jetty is completed, although a further extension seaward might be desirable. The inlet is securely established between these two lines of solid reinforced concrete jetty, and is effectually prevented from migrating up and down the coast as it formerly did. Although still somewhat obstructed by the false work and railroad trestle, the currents of the flood and ebb tide have kept the inlet open, and the small pleasure boats and fishermen's power dories have had sufficient depth and breadth of channel. The Avon beach has built seaward on the north side of the jetty as was expected, so that that side is effectively protected from heavy seas by a wide bank of sand (Fig. 6). There is not the remotest possibility that the sea will ever cut its way through on the north side of the jetty and resume the course it formerly followed before the improvement was commenced.

It is extremely desirable that the work be fully completed as originally planned, and every effort will be made to find ways and means of financing the project.

GEOLOGY.

Mineral statistics.—The customary statistics relating to the mineral industry for 1915 were collected in coöperation with the United States Geological Survey, the results being made known by press bulletins and tabulated statements sent the producers. For the sake of permanent record a summary is given on page 40. This shows that the total value of the mineral products amounted to \$33,364,117, an increase of \$813,519 as compared with the previous year.

Mineral Investigations.—Investigations by Prof. J. Volney Lewis show that the long-forgotten mica deposits of New Jersey

may prove to be a mineral resource of some importance under the present conditions of the mica industry. Twenty-five to fifty years ago, when various attempts were made to work these deposits, the only important use for mica was in stove doors; hence, there was a great demand for large clear sheets, free from spots and stains. Some mica is still used for this purpose, but the chief demand for the mineral to-day comes from the great electrical industries, where it finds many applications as an insulating material. For these purposes clearness and color are of no consequence, and even very small pieces are used in great quantities. Most of the mica now used would have been thrown away a generation ago; and, in fact, many of the old waste heaps in the mica-mining regions of North Carolina and Vermont have been worked over with profit in recent years.

The principal mica deposits that attracted attention years ago in New Jersey are found at two localities in Morris County and two in Warren County. The former are (1) 4 miles west of Morristown, near the Mendham road, and (2) 1 mile south of Mendham; the latter (1) $3\frac{1}{2}$ miles west of Washington and 1 mile north of Broadway, on the south slope of Scotts Mountain, and (2) 6 miles northeast of Phillipsburg and 3 miles north of Stewartsville. In all of these the mica belongs to the variety known as phlogopite, or "amber mica," and it varies in color from gray to clear yellowish-brown. Under the old conditions it was considered inferior on account of its color, and great quantities of small sizes and dark-colored sheets of larger size were dumped in the waste. For all modern electrical uses it is equal in every way to the "white mica" or muscovite, and for some purposes it is even superior. For the thin strips that are used in the commutators of dynamos and motors, for example, phlogopite, or "amber mica," is preferred because it is softer and wears away at the same rate as the metal, thus avoiding the troublesome sparking that occurs when white mica is used.

In prospecting for mica, it must be borne in mind that deposits of this mineral everywhere are notably irregular. In some places a vein several feet thick may be all, or nearly all, mica, while a short distance away the same vein may be filled with

quartz and feldspar and contain little or nothing of value. Even where mica is abundant it is sometimes found so badly crushed and split into such narrow "ribbons" that it is worthless except for grinding. The veins are exceedingly variable also in thickness, a large promising deposit thinning down to a few inches or even "pinching" out altogether in a short distance, perhaps; but this is no indication that the deposit is exhausted, and the experienced mica miner will continue to follow the vein many feet, or even scores of feet, further before abandoning it, and often it is found to widen out to great thickness again.

The average value of sheet mica for the 10-year period preceding 1914 was 18.7 cents per pound, but the prices for the larger sizes of stove mica were considerably higher than this. Scrap mica for grinding averaged \$13.78 per ton. These are values at the mines, and the market prices would, of course, include the additional cost of hauling, freights, etc.

Clay investigations.—During the early part of the year the Department continued the coöperative work in testing New Jersey clays which had been commenced in September, 1915, in coöperation with the State School of Ceramics, under the immediate direction of Dr. C. W. Parmelee and S. M. Sharkey.

A partial report of the results attained was made in the winter at the meeting of the New Jersey Ceramic Society. Later in the year changes in the personnel at the State School of Ceramics, including a change in the Director, delayed the work, but under the new Director, G. H. Brown, the tests are being continued. This work, while, perhaps, not of popular interest, is of great importance to the clay manufacturers and clay producers—an industry the value of whose product in this State is upwards of \$16,000,000 annually.

Clay pits in the region of Woodbridge, N. J., were the first visited; later samples were procured at Fords, Metuchen and Trenton. All pits were located on large-scale maps by a method of subdivided sections.

All strata in each pit were entered in the records from the top downward as A, B, C, etc., and the average thickness of each stratum was recorded. A sample from each layer was

obtained by quartering a 500-pound sample down to about 60 lbs. When the samples arrived at the laboratory each one was given a number by which it was known throughout the work.

Small samples of the first 125 clays were preserved in their original state. The remainder of the samples were ground in the dry pan, passed through a 20-mesh screen, and replaced in the bags.

Small batches of the ground clays were worked up to a plastic condition, aged, hammered into long strips, and cut into tile which were repressed later. About twenty-five tile were made from each batch. Cones for fusion tests were also made, and the fusion point of each clay was determined.

Another larger sample of the ground clay was dried for four hours at 212° – 220° F. A small portion of this was reserved for screen tests, another was mixed with an equal amount of flint and wedged up, and still another was mixed with an equal weight of standard Ottawa sand and worked to a plastic mass. The clay flint mixture was made into cubes for slaking tests, and the clay-sand mixture was made into figure 8 shaped briquets for bonding strength tests. The remainder of the dried samples in each case was used for making the following tests or pieces: (a) Normal consistency and water of plasticity; (b) Slaking cubes; (c) Porosity, shrinkage, and transverse strength bars, 10 cm. long; (d) Figure 8 shaped tensile strength briquets; and, (e) in some instances, warpage bars, 9" long.

The transverse, tensile, and bonding strengths were taken as the mean of 12–15 trials in each case. Drying shrinkage was measured on the transverse strength bars.

The porosity bars, about ten for each clay, were measured for volume and porosity. These bars, along with the tile previously mentioned, were burned to six or seven different temperatures in our large kiln. Porosities, absorptions, volumes, volume changes, color, etc., were determined for each clay at each cone. These operations required 6,500 weighings to hundredths of a gram. Many of the burned tile, which were made for exhibition purposes, have been sent to the clay miners.

The screen tests were made by washing 100 grams of the dried clay through a series of standard screens of 35, 65, 100, 150, and 200 mesh, and determining the percentage of material remaining on each screen. A microscopic examination of the residues was made, and the minerals present were recorded in each instance. The tile were made for exhibition purposes for the miners; they show color, density, vitrification, etc., at the different burning temperatures. They are of great use to the miner for reference and in the sale of clays. The fusion points measured, of course, the refractoriness of the clays. The normal consistency of water of plasticity indicate roughly the plasticity and workability of the clay. The slaking tests give a relative idea of tightness and set in the dry state. The tensile, bonding, and transverse tests give an idea of the plasticity, and reveal the strength or lack of strength in the dry condition. The warpage tests make possible comparative estimates of load-carrying capacities at high temperatures. The screen tests show the percentage of material that remains on each standard screen, the total residue coarser than 200 mesh, and the minerals present. The dry, soaked, and suspended weights make it possible to calculate the volume change, burning shrinkage, porosity, absorption, etc., at each temperature. Thus the vitrification range is determined. The burning colors are recorded according to some scale. These data tell the best use to which the clays may be put, *i. e.*, to make tile, fire brick, face brick, terra cotta, saggars, etc. All the work has been completed on the first 125 clays from the Woodbridge district. In addition, tile and cones have been made from fifty clays from the neighborhood of Fords and Metuchen and from seventeen clays from around Trenton. These are now being burned at six different temperatures.

As a result of this work, a New Jersey clay is now being used in the manufacture of lead pencils. Up to the time of the war German clays were used for this purpose. At the present time mixtures of New Jersey clays are being made with a view to their being used as a substitute for the German Klingenberg clay, which until recently was imported in large quantities for

use in the manufacture of graphite crucibles. Numerous inquiries, both from within and without the State, in regard to where clays suitable for certain purposes may be found in New Jersey, come to the Department and to the School of Ceramics. Under this coöperative agreement they are answered by the School of Ceramics. By consulting data and trial pieces secured in connection with this investigation it has been possible to select clays having properties suitable for the purpose desired.

Particular instances of this have occurred, and clays suitable for the manufacture of saggers have been recommended to dealers and users of sagger clays. Clays also suitable for the manufacture of abrasive wheels have been recommended to manufacturers of these products.

The samples of burned tile which have been submitted to the miner of each clay have been of value in classifying clays according to the uses for which they are best adapted. By consulting his trials, the miner has been enabled to state what the color and general behavior of his clay will be when burned to a certain cone.

In the final compilation of the data, it is hoped that it will be possible to establish some classification of New Jersey clays in accordance with their properties.

Reported oil discoveries.—Late in October the discovery of oil in a well three miles east of Millville was announced in the newspapers. Geologists of the Department were aware of this boring, and earlier in the year had visited the locality. R. B. Gage, Chemist of the Department, made an immediate investigation and obtained a sample of oil said to have been taken from the well. At the time of his visit operations were at a standstill. There was some oil in the pipe, but it was not possible to determine the quantity. Two weeks later another visit was made by the State Geologist and E. W. Shaw, of the U. S. Geological Survey. Operations were still suspended and the lower end of the pipe was reported blocked. No effort had been made to pump the well, and the only oil obtained had been a relatively small amount baled out and distributed as samples. Information was not obtainable regarding the depth of the well

or the sequence of strata penetrated, although these were promised later. No signs of oil or of oil-bearing strata were noted in the "slush" piles at this or the previous visit.

The sample of oil furnished was analyzed by the Chemist of the Department with the following results:

Analysis of Sample of Millville Oil.

Specific Gravity at 60° F.,	0.85 or 35° Be.
Flash Point,	58° C.
Fire Point,	73° C.
Distillate, 1 to 150° C.,	0.4%
" 150 to 300° C.,	55.2%
" 300 to 315° C.,	14.38%
Residue, about,	30.0%
Solubility in ether,	100.0%

It contains little or no gasoline and very little kerosene, but it is rich in lubricating oils. On distillation at 315° C, there was evidently some chemical change, due probably to the breaking up of some constituent, and a strong pungent odor was given off, which is not unlike some grades of fish oil. The residue after distillation is fairly thick, quite full of paraffine and is completely soluble in ether.

In view of the public interest aroused, it seems proper that a statement be made by the State Geologist regarding the probability of the occurrence of oil in southern New Jersey in commercial quantities, and, if so, whether there are any means other than boring by which oil-bearing territory can be located.

It is to be noted, first, that the strata are of an age similar to oil-bearing strata elsewhere; that they contain some carbonaceous matter which is needful as a source for petroleum; and that they have suffered no intense deformation or metamorphism. In so far as these considerations have weight, they are in favor of the view that oil may exist in commercial quantities. There are, however, considerations on the other side. Carbonaceous matter, although present in the strata, is relatively scarce, in fact, is much less abundant than in producing fields; the relative sandiness and great porosity of the coastal plain sediments underlying New Jersey are more favorable for the escape

of oil as fast as formed rather than for its confinement and accumulation; the general occurrence of fresh water everywhere in the coastal plain sediments of the State and the absence of salt water in these deposits, except in a very few wells close to the ocean, point to a free circulation through these beds which would prevent the accumulation of oil in pools; moreover, in none of the many deep wells drilled for water in the coastal plain, to a depth in one instance of 2,300 feet, has any sign of oil been found. This is true even for the wells nearest to Millville.

In some regions the occurrence of oil is indicated by oil-seeps, the outcrop of oil-bearing shales, or the occurrence of bitumen in the rocks. No instance of oil seepage and no oil-bearing shales have ever been observed by any worker on the State Geological Survey. Since the Survey has been continuously active since 1864, and the geology of the State has been studied to a more minute degree than that of any other State, the conclusion seems irresistible that they do not occur.¹ The iridescent iron scum sometimes formed on water has often been mistaken for oil by the unskilled, but it can be differentiated by its taste and odor. Bitumens are reported in minute quantities, but not in conditions suggestive of oil.

The magnetic needle has long been employed to locate beds of magnetic iron ore. The witch hazel or peach twig wand has for many years enjoyed an ill-deserved reputation among the ignorant and credulous as a means of finding water, and occasionally there have been individuals who have claimed to locate oil by some special instrument. It should, however, be hardly necessary to state that no instrument is known to oil operators, to mining engineers or to geologists by which the occurrence and location of oil in the earth can be detected in advance of boring.

With very few exceptions, the commercial oil fields are marked by certain characteristic structural features of which arches and domes are most common. Within the limits of these structures

¹ Since writing the above the State Geologist has been advised by T. G. Clapp that he had observed occasional bubbles of a very light oil rising in a spring in Ocean county.

oil is found, beyond them wells are dry. The entire southern part of New Jersey is underlain by a series of alternating beds of sand, clay and gravel, with some layers of greensand marl. In exposures these appear horizontal, but a comparison of sections shows that they have a gentle dip or slant downward to the southeast. This is forty feet or more per mile for the basal beds and ten or fifteen feet per mile for the upper members of the series. Folds, arches or dome structure, common in nearly all commercial oil fields, are not known to exist. If any structure favorable to the accumulation of oil is present in the Millville region or elsewhere in southern New Jersey, it is not manifest upon the surface, and there are no surface means by which its extent or direction can be determined. Since no characteristic oil structures are known and no surface indications of oil have been found here, there are no means known to geologists by which the extent of an oil field can be determined except by actual drilling.

In view of the above facts the State Geologist and his associates have reached the conclusion that it is unlikely that an oil pool of commercial importance exists in the State. If their conclusions are well founded, all drilling for oil in this State is yet speculative and should be undertaken only by those who fully understand the hazards of the game and can afford to lose their entire venture.

SOIL SURVEY.

The study and mapping of the soils of the State was continued throughout the year in coöperation with the United States Bureau of Soils at Washington, D. C., and the State Agricultural Experiment Station at New Brunswick. Five men have been engaged in this work for varying periods, Austin L. Patrick and J. M. Snyder, representing the United States Bureau of Soils, and C. C. Engle, L. L. Lee and H. A. Miller, the Department of Conservation and Development. The State Agricultural Experiment Station contributed \$500 to the expense of the field work, besides carrying on collateral soil studies, chiefly the analysis of soil samples.



On November 1, 1915, Mr. Engle and Mr. Patrick began field work in the vicinity of Millville, in the area covered by atlas sheet 35, and continued until inclement weather set in, about the middle of December. Mr. Patrick was then transferred to the South, and Mr. Engle spent the winter months compiling the results of the previous season's work in the Camden area, collecting samples of marl for analysis by the Experiment Station, and assisting in the mechanical analysis of the soils. Work in the Millville region was resumed by Mr. Engle about the first of May, and by Mr. Patrick on May 27. On June 12 the party began work at Belvidere, Warren County, since much better progress could be made during the hot summer months in an area in the northern part of the State. On June 20 J. M. Snyder and H. A. Miller entered the field, and on July 1 they were joined by L. L. Lee. The work in Warren and Hunterdon counties (atlas sheet 24) was pushed energetically until October 7, during which period approximately 500 square miles were mapped, leaving in this area only 136 square miles to be completed next season. Mr. Miller's employment having been for the summer vacation only, he left the party September 15th. On October 7 field work in the Millville area was again taken up to be continued for the balance of the season. To October 31, the end of the fiscal year, 294 square miles had been mapped in the Millville area, making a total of 794 square miles surveyed during the year in the two areas.

In addition to the field work, the manuscript and maps covering the Camden area, surveyed during the previous year, were completed and the report forwarded to the Bureau of Soils in Washington for publication. Arrangements have been made with the Public Printer for the purchase of a small edition of this report for distribution by the Department of Conservation and Development. This will be in addition to the much larger edition to be published and distributed by the United States Bureau of Soils itself and through the Congressmen in whose district the area lies.

During the year the soil report and map on the Freehold area which embraces the northern part of Monmouth County was

published by the Bureau of Soils. This covered the coöperative field work done in previous years. A limited number of copies of this report can be obtained of the State Geologist upon request.

TESTING LABORATORY.

Work Done.—The work done has been much the same as in previous years. It is chiefly the testing of road materials and pavement samples of various types, undertaken at the request of the Commissioner of Public Roads.

During the past year over 150 samples of oil and asphalt, 100 pavement samples, between 80 and 90 pavement aggregates and nearly 100 minerals and rocks have been tested or analysed. During the latter months of the year the number of samples sent for testing was so far in excess of the capacity of the laboratory that it will take until the middle of next February to complete the work on materials now on hand. It has been impossible to take up work on certain classes of materials, although existing road specifications require that these be subject to test. This condition cannot be remedied until a new laboratory building is built and equipped. Until that is done the most important lines of work must be selected and the others left undone.

New Building.—As stated in the report for last year, the appropriation for a new building was inadequate, and work could not be started, although a lot had been purchased. In April the Legislature reappropriated a sum of \$23,500, deemed at that time to be sufficient to build and equip a building at prices then prevailing. Inasmuch as the item was not available for use until November 1, 1916, the beginning of the present fiscal year, no steps could legally be taken in preparation of plans and specifications in advance of that date.

The rapid rise since last year in the price of all materials, and in particular, in some classes of equipment, which will be necessary, may cause further delay if the lowest bids should again exceed the appropriation.

The importance of the early completion of a new building is the greater in that this laboratory has been designated by the State House Commission as one of the laboratories "for the

execution of such functions as may hereafter be required" by this Commission, as provided by Section 7 of the (State Purchasing) act.

In view of a very considerable increase in the amount and diversity of work which will certainly be demanded in the near future, the importance of early completion of the new building cannot be overestimated.

ARCHAEOLOGY.

During the early part of the year Mr. Max Schrabisch was occupied in completing the report on his surveys in Warren and Hunterdon counties. The manuscript was not received until late in the winter, and time has not yet been found for the necessary editorial work. No new field work was undertaken during the past summer.

The subject of traces of man in the sand and gravel along the Delaware River at Trenton has first and last received much attention from archæologists and geologists. During the past year or two further studies have been carried on under the direction of the American Museum of Natural History. The material discovered in this investigation was examined by Prof. J. Volney Lewis to determine its lithologic character and probable source.

STATE MUSEUM.

In the report for last year the necessity of a thorough reorganization of the State Museum was emphasized. In reaching a final decision as to the plan to be adopted the Board was greatly influenced by the experience of the Newark Museum and the counsels of its Director, Mr. J. C. Dana, and of Miss Louise Connolly, whose success in harmonizing museum and school work has been marked. It was, however, easier to formulate a plan of reorganization than to find the right person to carry it out. Finally, through the coöperation of Mr. Dana, Miss Helen C. Perry, of the Newark Museum staff, was engaged and began work June 1. In the following paragraphs Miss Perry sets forth the results already accomplished and her plans for the future:

"The State Museum is being reorganized on an educational basis, with two main objects in view: the one, to make it attractive and useful to the community; the other, to make its collections available for educational purposes throughout the State.

"Most of the summer has been spent in laying the foundations for carrying out these two plans. The Museum rooms have been redecorated, the cases remodeled, much old equipment discarded, and some new added. The collections of natural history specimens have been carefully gone over, cleaned, catalogued, and stored where they are easily accessible. The duplicates, of which there were a great number, have been made up into school-lending sets. The other collections have been catalogued and stored, made up into lending sets, or rearranged for exhibition purposes. Much new material has been added, especially industrial process exhibits typical of the State. A number of the leading manufacturers of Trenton and other parts of the State have already given the Museum such exhibits and others are promised.

"No one of the collections, either of natural history, geology, forestry or industry can be shown in its entirety, because of lack of space, but special exhibits, representative of the various collections, will be put up and changed from time to time. In this way the Museum will be constantly showing exhibits of fresh interest. The displays will be popular in style, with simple, untechnical labels. Instead of synoptical collections of birds, for instance, there will be cases showing bird-houses, how birds get their food, birds to be seen during the winter months, etc. But there will be a complete reference set of New Jersey birds available to students for special study. The industrial exhibits will include materials, steps in the process of manufacture, and the finished products, with pictures and labels to complete the story. The other collections will be shown in the same popular style.

"The Museum hopes to be particularly useful to the schools of the State. For the schools outside of the city, a circulating library of teaching materials, including lantern slides, natural history specimens, industrial process charts, minerals, woods,

etc., is being established. These lending collections are all to be arranged in standard sizes to fit the school-lending cases, of which about seventy are being sent out. A teacher may order certain charts or specimens, keep them a few weeks or months, and exchange them for others. There are, of course, only duplicates of Museum materials.

"Within the city the Museum can do even more for the schools. A teacher may telephone that she wishes to teach a lesson on fossils, game birds or pottery, and the specimens will be laid out on a large work table, or in special show-cases, where the class may come to study them. By special arrangement later on appointments can be made by any group for lantern-slide lectures in the Museum.

"In return for these privileges the schools will help the Museum (a number have already volunteered) by arranging insect life histories, preparing industrial process charts of local industries, collecting fresh wild flowers for the spring wild-flower exhibit, making picture collections, sending in natural history specimens of all kinds, and in countless other ways that will naturally develop.

"There will be special exhibits of various phases of education from time to time, which will be shown first in Trenton, and then sent as traveling exhibits to other centers.

"Later on, if there is a demand for it, classes in docentry may be formed, consisting of teachers, normal students, club women and others who may volunteer to help out the Museum staff in giving lectures on exhibits or lantern slides to groups of school children, shop employees, clubs, or other groups.

"The reorganized Museum, then, will be a large, light room, with uncrowded, carefully arranged and labeled exhibits, and a big reading and work table. There will be rugs and tapestries and bright pieces of pottery (all Jersey made) to make it attractive to the visitor. For the students there will be books and access to complete synoptical reference collections; for the teacher within the city the privilege of bringing her classes and using the Museum as a laboratory; for the teacher outside the city the lending sets which she may have upon application;

for the nature lover an opportunity for a more intimate knowledge of nature; for the laborer a vision of the meaning of the work of his hands; and for the sightseer some conception of the resources of the State of New Jersey.

"Of course, this plan will of necessity take time to work out, but with teacher, pupil, manufacturer, laborer, and the general public all helping with work, interest, and gifts, the Museum will soon become what it should be—a thoroughly live institution of State-wide usefulness."

WATER RESOURCES.

Work of State Water-Supply Commission.—As indicated above, on July first the Board of Conservation and Development took over that part of the work of the State Water Supply Commission which was not affected by Chapters 70 and 71, P. L. of 1916. The first of these laws divided the State into two water-supply districts, and the second provided for the appointment of District Water-Supply Commissioners and defined their powers and duties.

So far as can be made out from a study of the records, the following are the more important actions of the former Commission up to July 1, 1916.

Shark River Water Company.—The application received September 8, 1915, from the Shark River Water Company to divert water from Shark River to sell at wholesale was heard at Belmar on October 22, 1915. Written protests opposing the application were received from the Mayor of Belmar and from Asbury Park. On November 16, 1915, the application was taken up by the full board and the Engineer, and was rejected on the grounds that the applicant had failed to show sufficient public necessity for such diversion. A later application by the same company, made under date of February 1, 1916, was withdrawn on April 25, 1916.

Peoples Water Company.—The Peoples Water Company, on the fifth day of November, 1915, made application to the State Water-Supply Commission for approval of its plan to supply the Township of Raritan, in the County of Monmouth, with

water for public and private use from not exceeding five (5) artesian wells, not to exceed ten inches in diameter, to be driven on property to be occupied by said Company, and consisting of the westerly half of Block R, as shown on a map known as "Map of West Keansburg Beach, Keansburg, Monmouth County, New Jersey," a public hearing was held upon said application in the School House at Keansburg, Monmouth County, New Jersey, at 2 o'clock P. M. on Saturday, December 18, 1915, at which time and place there was opportunity for all persons and municipalities affected by the proposed plans to be heard for or against the granting of the application. On January 4, 1916, the application was approved subject to the following conditions:

1. This approval is given for a period of thirty years, with the right of renewal at the expiration thereof for twenty additional years from the date of this consent, subject to such annual charge by the State as now or may be hereafter authorized by law.

2. This grant shall not be construed to empower or permit the Company, its successors or assigns, to use any of the waters mentioned in this petition for which it shall not have first obtained approval as to quality of such water by the State Board of Health.

3. Upon action of the municipality authorized in this consent to be furnished with water from the source applied for and hereby granted, or upon such action by any other municipalities which may hereafter be supplied therefrom, and upon one year's notice in writing served upon the said Peoples Water Company, should said municipality, or municipalities, acquire the water plant of the Peoples Water Company no additional value shall be included in any payment for such plant for diversion rights as against the State during any period covered by this grant, but the acquisition of such plant shall otherwise be subject to such terms and conditions as may now be a part of any grant or franchise given by the said municipalities to the Peoples Water Company.

4. The said Peoples Water Company shall in good faith begin the construction of the works mentioned in its application within six months from the date of this assent, completing the same within one year thereafter.

5. This assent shall not become operative unless said Company shall have filed with this Commission its agreement in writing to accept the terms and conditions hereby imposed within ninety days from the date hereof.

6. Upon condition that at any time hereafter any municipality to be supplied shall purchase or acquire the property or works of the Company, or that portion thereof supplying such municipality with water, this grant shall be in perpetuity as regards such portion so acquired, or so long as such municipality shall own such property, without payment for diversion rights as against the State, except such as may now or hereafter be imposed by law. If such

municipality shall at any time after purchase abandon this source of supply all rights hereby granted shall revert to the State, nor shall the rights hereby granted be assigned or set over to any corporation or person without first obtaining the consent of this Commission.

Formal acceptance of the terms and conditions imposed were filed with the Commission on March 3, 1916.

Island Heights.—On March 7, 1916, the State Water-Supply Commission adopted the following resolution:

"WHEREAS, The Borough of Island Heights, on the ninth day of December, 1915, made an application for permission to construct a new water-supply plant in accordance with plans and specifications filed with the Commission; and

"WHEREAS, The Commission held a hearing in accordance with the provisions of the law, and testimony was taken for and against the granting of said application; and

"WHEREAS, On March seventh, the subjoined letter was received from the Borough of Island Heights, and concurred in by counsel for the Island Heights Water, Power, Gas and Sewer Company, requesting permission to withdraw the pending application because the said Borough of Island Heights had entered into an agreement to purchase the plant of the Island Heights Water, Power, Gas and Sewer Company.

Therefore, be it resolved, That the pending application of the Borough of Island Heights for consent to construct a new water plant be and hereby is denied, and the Secretary be instructed to send a copy of this resolution to the Attorneys for the Borough of Island Heights, and to the Counsel for the Island Heights Water, Power, Gas and Sewer Company."

"February 28, 1916.

State Water-Supply Commission, State House, Trenton, N. J.:

GENTLEMEN—The Borough of Island Heights and the Island Heights Water, Power, Gas and Sewer Company have agreed upon a price for the sale by the Company to the Borough of its water plant and system. In view of this fact the Borough of Island Heights hereby withdraws its petition for permission to construct a water plant and system, which petition was filed on or about the 7th day of December, 1915.

Yours truly,

WILFRED B. WOLCOTT,
Borough Solicitor."

Linden Water Company.—On May 2, 1916, the Linden Water Company made application for permission to divert water from the Rahway River to supply the Township of Linden. A hearing was advertised and postponed, and later when it became apparent that the application could not be finally acted upon

before June 30, the date on which the powers of the State Water-Supply Commission expired, consent was given to its withdrawal.

Dams.—During the year the Ocean County Electric Company submitted plans for a dam at Toms River, which were approved. The plans submitted by the Butler Water Company for an intake reservoir dam on Apshawa Creek were approved on April 4, 1916, after modification to meet the views of the Consulting Engineer of the Commission.

Excess diversion charges.—On June 27, 1916, the Commission adopted the following resolution in regard to the charges for excess water diversion, which had been levied against the East Jersey Water Company.

"WHEREAS, Acting upon the advice of the Attorney-General, the State Water-Supply Commission did not certify to the State Comptroller for collection of the excess diversion charges against the East Jersey Water Company for the years 1908-9-10-11-12-13-14 and 15, in accordance with the provisions of Chapter 252, P. L. 1907, for the reason that the Commission did not admit the right of the said Company to divert water from the Passaic River, which question was in process of litigation during that period, and the Commission was advised that such excess diversion assessment if actually certified to the Comptroller for collection might be deemed a license for the diversion of water to the prejudice of the pending litigation; and

"WHEREAS, The said litigation having been concluded by final Court decision in 1915, upon the advice of the Attorney General, on February 7, 1916, the Commission certified to the State Comptroller for collection accrued assessments for excess diversion for the several years above mentioned to the total amount of \$6,362.08, and the East Jersey Water Company having demanded a hearing upon the question as authorized by law, which was held in the office of the Commission in the State House at Trenton, at which hearing testimony was taken and brief submitted by Counsel for the said Water Company, with the result that the Attorney-General filed a written opinion bearing date June 12, 1916, advising the Commission that the total amount of \$6,362.08 so certified to the State Comptroller was illegally assessed, and that the collection of these charges for excess diversion under the present law is doubtful, and too uncertain to justify a suit for the recovery of the same; therefore, be it

"Resolved, That the excess diversion charges against the East Jersey Water Company for the years 1908-1909-1910-1911-1912-1913-1914 and 1915 amounting in total to \$6,362.08 be and hereby are cancelled; and be it further

Resolved, That this resolution be spread upon the minutes and copies of the same be transmitted to the State Comptroller and to the Counsel for the East Jersey Water Company."

Extensions of time.—On June 27, 1916, an extension of one year from June 16, 1916, was granted to Witherbee, Sherman & Co. for the completion of its proposed plant in Middlesex County. Extension of three months from July 4, 1916, was granted to the Peoples Water Company for beginning work at Keansburg, Monmouth County.

In July the Board of Conservation and Development approved the following application:

New Egypt Light, Heat, Power and Water Company.—The New Egypt Light, Heat, Power and Water Company, on May 17, 1916, filed a petition for permission to divert water from Crosswicks Creek for an additional supply for use in case of fire. A public hearing upon the application was held in the State House at Trenton, on August 2, 1916, at which all persons desiring to be heard for or against the approval of the application were heard. On the same date the application was approved subject to the following terms and conditions:

1. This approval is given for a period of thirty years, with the right of renewal at the expiration thereof for twenty additional years, subject to such annual charge by the State as is now or may be hereafter authorized by law.
2. This approval is limited to the diversion of water for fire purposes only in emergencies when the present supply from the artesian well is inadequate.
3. The said New Egypt Light, Heat, Power and Water Company shall in good faith begin the construction of the works mentioned in its application within six months from the date of this approval and shall complete the same within one year.
4. This approval shall not become operative unless said company shall have filed with this Board within ninety days from the date hereof its written agreement accepting the terms and conditions hereby imposed.

Formal acceptance of the terms and conditions imposed was filed with the Board on October 31, 1916.

Pending applications.—At the close of the year there were also before the Board the following applications on which hearings had either been ordered or held:

The Linden Water Company, to divert water from Rahway River for the supply of Linden Township, on which hearings had been held on October 4 and 18;

The North Jersey District Water-Supply Commission in behalf of the cities of Newark and Paterson, to divert 50,000,000 gallons per diem from a storage reservoir to be constructed on the Wanaque River at or near Midvale;

The West Monmouth Water Company, to divert ground water from wells to supply the Borough of Farmingdale;

The West Monmouth Water Company, to divert ground water from wells to supply the Borough of Englishtown.

Other matters.—The Peoples Water Company of Keansburg has been granted an extension of time for beginning work from October 4, 1916, to April 1, 1917.

The Assistant Engineer has at intervals inspected the construction of the Apschawa dam and reported thereon.

On August 15, 1916, the following petition was received from the Township Committee of North Plainfield:

"We hereby present a request to you to investigate and take action upon the dam and retaining wall at Seeley's Mills, located in North Plainfield Township, near Scotch Plains, said dam, owing to the recent freshet, being in an unsafe condition, and roads and property are in danger of damage.

This request is in accordance with a resolution passed by the Township Committee of North Plainfield Township at its regular meeting on August 10.

We would request that prompt action be taken in this matter, as the main road has been completely undermined by the waters flowing over this dam, and is now blocked off completely for traffic.

Very truly yours,

(Signed) WILLIAM DELAROCHE ANDERSON,
Chairman, Township Committee."

An inspection of the dam was made both by the Assistant Engineer and the State Geologist, and the petitioners and owners were notified that the Board would hear the matter on September 6, 1916. On that date, no one appearing on either side, the petition was by unanimous vote laid on the table.

Ground Waters.—The State Geologist is in frequent receipt of requests for information regarding the occurrence of ground water and the depths at which water-bearing strata may be found. Replies are always made and the questions answered in such detail as the facts at hand warrant. All available well records are tabulated for reference and well drillers and others are urged to furnish the department with such information.

PUBLICATIONS.

The various reports of the State Geologist contain a vast amount of information relative to the natural resources of New Jersey. From its nature much of this is of permanent value, entirely independent of its date of publication. Copies of most of the reports published since 1884 are available for distribution, without cost except that of transportation, to persons who have good reason for receiving them. *When the stock on hand of any report is reduced to 200 copies, the remaining volumes are withdrawn from free distribution and are sold at cost price.*

The Geological Survey has published two sets of topographical maps of the State, one on a scale of one mile per inch and the other 2,000 feet per inch. These are sold at 25 cents per sheet. It has also issued several maps of the entire State on a single sheet, at prices varying from 35 to 50 cents. In co-operation with the United States Geological Survey, it is also publishing a Geologic Atlas of New Jersey, to be issued in several parts, each folio containing topographic and geologic maps, illustrations and descriptive text. Five of these folios have been issued, and are sold for 25 and 50 cents, according to size.

Special circulars have been prepared describing these publications, which will be sent on application. All requests for reports or information regarding the same should be addressed *State Geologist*, Trenton, N. J.

APPENDIX.

Statistics of the Mineral Industry of New Jersey for 1915.

As heretofore, these statistics were collected and compiled in coöperation with the United States Geological Survey. The tabulated results with summary statements were made public through the newspapers as early in the year as possible, and were sent to the producers. As a matter of permanent record and for future reference they are here made a part of the State Geologist's report. In order to avoid revealing individual production it has been necessary in some cases to group together several industries or classes of products which have no logical connection.

Total Value of Mineral Industries in New Jersey During 1915.

<i>Product.</i>	<i>Number of Producers.</i>	<i>Value in 1915.</i>	<i>Value in 1914.</i>	<i>Increase or Decrease.</i>	
Clay and clay products,	198	\$16,583,322	\$17,133,236	\$549,914	D
Stone,	79	1,612,061	1,547,773	64,288	I
Portland cement,	3	1,607,706	3,081,205	1,473,499	D
Sand and gravel,	82	1,447,557	1,544,322	96,765	D
Iron,	3	1,140,400	1,076,208	64,192	I
Mineral water,	13	116,226	155,649	39,423	D
Lime,	10	35,393	41,226	5,833	D
Other products, ¹	13	10,821,452	7,970,979	2,850,473	I
Total,	401	\$33,364,117	\$32,550,598	\$813,519	I

ZINC ORE.

The great demand for spelter during 1915 resulted in a great increase in the production of zinc ore at the mines of the New Jersey Zinc Company. At the Franklin mine 742,379 tons of

¹ Includes zinc ore, mineral paint, coke and by-products, sand-lime brick, and greensand marl, which are here grouped together to conceal the production of individual producers.

ore were hoisted, while at the Ogdensburg mine, in connection with the development work there, 3,459 tons were raised, a total of 745,838 tons. This represents an increase of 256,608 tons over the production for 1914.

The total amount of ore shipped from the mines during the year was 623,822 tons. Its value is included in making up the total of the mineral production for the State.

Zinc Ore Mined in New Jersey Since 1880.

Previously reported,	6,701,355 short tons
Mined in 1915,	745,838 short tons
Total,	7,447,193 short tons

IRON ORE.

Three companies engaged in iron mining during 1915, operating five groups of mines: The Empire Steel and Iron Company operating the Mount Hope group, the Allen mine, and the Oxford group, the Thomas Iron Company operating the Richard mine, and the Ringwood Company working the Peters mine. The production was 415,234 long tons, an increase of 65,099 long tons; 391,115 long tons were marketed at a value of \$1,140,400, an increase in quantity of 44,295 long tons and in value of \$64,192. The stock on hand at the mines at the close of the year was 178,284 long tons. All of the ore was magnetic.

Total Iron Ore Mined in New Jersey Since 1870.

Previously reported,	20,490,407 long tons
Mined in 1915,	415,234
Total,	20,905,641 long tons

CLAY AND CLAY WORKING INDUSTRY.

The production for 1915 is the lowest reported since 1908, there being a decrease of nearly one-half a million dollars from the figures of 1914. Details are given in the following table:

Production of Clay and Clay Products in New Jersey, 1915.

	<i>Value</i> 1915.	<i>Value</i> 1914.	<i>Increase</i> or <i>Decrease.</i>
Clay (mined and sold raw),	\$617,904	\$648,584	\$30,680 D
Clay-Products:			
Pottery,	8,049,338	8,131,356	82,018 D
Brick and Tile,	7,916,080	8,353,296	437,216 D
Total,	\$16,583,322	\$17,133,236	\$549,914 D

Clay.—The following table shows the amount and value of the clay mined and sold raw. It does not include the value of the clay mined by any manufacturer.

Clay Mined and Sold Raw, 1915.

<i>Varieties.</i>	<i>Number of</i> <i>Producers.</i>	<i>Amount</i> <i>in Short</i> <i>Tons.</i>	<i>Value</i> 1915.	<i>Value</i> 1914.	<i>Increase or</i> <i>Decrease.</i>
Ball clay,	7	8,369	\$27,879	\$13,341	\$14,538 I
Fire clay, including sagger clay,	36	227,813	412,353	485,599	73,246 D
Stoneware clay,	10	12,871	28,706	25,532	3,174 I
Brick clay,	6	19,886	35,808	24,229	11,379 I
Miscellaneous,	14	71,787	113,158	99,883	13,275 I
Total,	45	340,726	\$617,904	\$648,584	30,680 D

Pottery.—Details in regard to the production of pottery are given in the following tables:

Pottery Production of New Jersey, by Varieties, 1915.

<i>Varieties.</i>	<i>No. of</i> <i>Producers</i> <i>Reporting.</i>	<i>Value</i> 1915.	<i>Value</i> 1914.	<i>Increase or</i> <i>Decrease.</i>
Red earthenware,	6	\$34,600	\$35,198	\$598 D
Stone ware and yellow or Rockingham ware,	3	91,815	72,288	19,527 I
White ware, including C. C. ware, white granite, semi-porcelain ware and semi-vitreous porcelain ware,	8	665,633	727,637	62,004 D
China, bone china, delft and belleek ware,	7	983,855	1,076,043	92,188 D
Sanitary ware,	20	4,793,406	5,058,204	264,798 D
Porcelain electrical supplies,	13	1,028,992	905,878	123,114 I
Miscellaneous,	11	451,037	256,108	194,929 I
Total,	54	\$8,049,338	\$8,131,356	\$82,018 D

Pottery Production in New Jersey, by Counties, 1915.

Rank in 1915.	Counties.	No. of Producers Reporting.	Value 1915.	Value 1914.	Increase or Decrease.	
1	Mercer,	34	\$6,632,730	\$7,101,197	\$468,467	D
2	Middlesex,	5	732,791	418,035	314,756	I
3	Hunterdon,	3	288,989	227,568	61,421	I
	All other counties,	12	394,828	384,556	10,272	I
	Total,	54	\$8,049,338	\$8,131,356	\$82,018	D

More than 60 per cent. of the sanitary ware made in the United States is made in New Jersey. New Jersey also ranks first in china ware, producing 42 per cent. of the output for the United States, and is third in porcelain, electrical supplies and in white ware. Considering the pottery products as a whole, New Jersey stands second among the States, Ohio being first.

Brick and Tile.—The brick and tile production suffered from the general depression in building trades which prevailed through so much of the year 1915, and nearly all lines showed decreases.

Production of Brick and Tile in New Jersey, 1915.

	No. of Producers.	Production in Thou- sands.	Value 1915.	Value 1914.	Increase or Decrease.	
Common brick,	50	354,104	\$2,099,654	\$1,944,806	\$154,848	I
Front brick,	10	25,698	375,431	377,779	2,348	D
Fancy brick,	4	.....	409,488	463,221	53,733	D
Enameled brick,						
Fire brick,	12	36,403	899,613	897,442	2,171	I
Total brick,	64	.....	\$3,784,186	\$3,683,248	\$100,938	I
Drain tile,	8	.....	\$41,331	\$31,043	\$10,288	I
Architectural terra cotta, ...	6	.....	1,430,968	1,620,791	189,823	D
Fireproofing and hollow blocks, ...	11	.....	1,389,120	1,599,295	210,175	D
Tile (other than drain tile),...	15	.....	995,097	1,139,895	144,798	D
Miscellaneous,	11	.....	275,378	279,024	3,646	D
Total tile, etc.,	46	.....	\$4,131,894	\$4,670,048	\$538,154	D
Total brick and tile, ..	99	.....	\$7,916,080	\$8,353,296	\$437,216	D

In the above production, Middlesex County was first, \$5,653,398, or 71 per cent. of the total; Mercer County second, \$403,533; Monmouth third, \$380,563, and Camden fourth, \$321,983.

The rank of New Jersey among the States in various lines of the clay industry was, for 1915, as follows:

First in Sanitary Ware, China Ware, Art, Tile, Enameled Brick and Clay (mined and sold as Clay).

Second in Fireproofing, Floor Tile, Wall Tile, Terra Cotta, and in Total Pottery Products.

Third in Porcelain Electrical Supplies, White Ware, and in Total Clay Products.

Fourth in Front Brick, and in Total Brick and Tile Products.

Fifth in Common Brick and Fire Brick.

PORTLAND CEMENT.

The year 1915 was one of extreme depression in the Portland cement industry. One of the plants located in New Jersey was shut down, and the output of the other two was much curtailed. Not only were production and shipments less, but prices per barrel at the mill were lower.

Production was 1,579,173 barrels, a decrease of 2,059,627 barrels; shipments were 1,977,474 barrels by three companies valued at \$1,473,499, a decrease of 1,553,002 barrels in quantity and \$1,607,704 in value from the year before. The prices for 1915 averaged \$0.745 per barrel as against \$0.873 in 1914. Since shipments exceeded production, the stock on hand at the mills at the close of the year was less than in 1914, being only 164,341 barrels. With the growth of the cement industry in other parts of the country, New Jersey's rank among the States is now twelfth.

STONE.

The stone industry is limited to the northern part of the State, and is chiefly in crushed rock for road metal, concrete and railroad ballast. Details are shown in the following series of tables:

Production of Stone in New Jersey, by Varieties, 1915.

	Value 1915.	Value 1914.	Increase or Decrease.	Per Cent. of Total, 1915.
Trap,	\$1,281,545	\$1,164,529	\$117,016 I	79.5
Limestone,	159,549	240,937	81,388 D	9.9
Granite,	95,986	74,808	21,178 I	5.95
Sandstone,	63,964	53,394	10,570 I	3.97
Slate,	11,017	14,105	3,088 D	.68
Talc and serpentine,				
Total,	\$1,612,061	\$1,547,773	\$64,288 I	100.00

Production of Stone in New Jersey, by Uses, 1915.

<i>Use.</i>	<i>Value 1915.</i>	<i>Value 1914.</i>	<i>Per Cent. 1915.</i>	<i>Per Cent. 1914.</i>
Crushed stone,	\$1,380,266	\$1,215,708	85.62	78.55
Road metal,	(822,214)			
Railroad ballast,	(260,426)			
Concrete,	(297,626)			
Blast furnace flux,	141,915	136,038	8.80	8.79
Building stone (rough and dressed) and monuments,	49,911	48,344	3.10	3.12
Paving, ¹	18,033	11,645	1.12	.75
Other uses, ¹	21,936	136,038	1.36	8.79
Total,	\$1,612,061	\$1,547,773	100.00	100.00

¹ To avoid revealing individual production, it has been necessary to include sandstone paving, curbing and flagging under the head of "other uses," along with rubble, rip-rap, limestone for agricultural purposes, slate, talc, etc.

Production of Limestone in New Jersey, 1915.

<i>Uses.</i>	<i>Number of Producers.</i>	<i>Quantity in Short Tons.</i>	<i>Value 1915.</i>	<i>Value 1914.</i>	<i>Increase or Decrease.</i>
Road making,	6	15,786	\$8,994	\$13,701	\$4,707 D
Concrete,	3	8,362	5,462	9,838	4,376 D
Blast furnace flux,	7	298,303	141,915	136,038	5,877 I
Other uses, ¹	5	4,982	3,178	81,360	78,182 D
Total,	10	327,433	\$159,549	\$240,937	\$81,388 D

¹ Includes limestone for building stone, rip-rap, railroad ballast, agricultural and other purposes.

The counties producing during 1915 were: Sussex, Hunterdon, and Warren.

Production of Trap Rock in New Jersey, 1915.

<i>Variety.</i>	<i>Number of Producers.</i>	<i>Amount in Short Tons.</i>	<i>Value 1915.</i>	<i>Value 1914.</i>	<i>Increase or Decrease.</i>
Paving blocks,	8	(479,400 blocks)	\$18,033	\$11,645	\$6,388 I
Rubble and Rip-rap,	4	.....	2,056	9,664	7,608 D
Crushed stone—					
Road metal,	47	984,300	752,960	625,536	127,424 I
Railroad ballast,	9	319,292	221,579	222,395	816 D
Concrete,	29	348,218	284,731	276,821	7,910 I
Other values (including rough building stone),	5	.....	2,186	18,468	16,282 D
Total,	51	1,651,810a	\$1,281,545	\$1,164,529	\$117,016 I

a The total amount of crushed rock in 1914 was 1,439,218 short tons.

The leading counties, in order of production, are: Somerset, Hunterdon, Passaic, Essex, Hudson, Mercer, Union and Bergen.

Production of Granite in New Jersey, 1915.

	<i>Number of Producers.</i>	<i>Value 1915.</i>	<i>Value 1914.</i>	<i>Increase, or Decrease.</i>	
Building and monumental,	2				
Rubble and Rip-rap,	2	\$4,129	\$7,391	\$3,262	D
Crushed stone, ¹	5	91,857	67,417	24,440	I
Total,	6	\$95,986	\$74,808	\$21,170	I

¹ The quantity of crushed stone in 1915 was 116,371 tons, being an increase of 13,137 tons over the year before.

Only Morris and Passaic counties reported a production in 1915.

Production of Sandstone in New Jersey, 1915.

<i>Variety.</i>	<i>Number of Producers.</i>	<i>Value 1915.</i>	<i>Value 1914.</i>	<i>Increase or Decrease.</i>	
Building stone (rough and dressed),	8	\$46,981	\$29,954	\$17,027	I
Other uses, ¹	4	16,983	23,440	6,457	D
Total,	9	\$63,964	\$53,394	\$10,570	I

¹ Includes stone for paving, curbing, flagging, rip-rap, road making, concrete, and other purposes.

The counties producing during the year were: Mercer, Hunterdon, Essex Bergen and Somerset, respectively.

Production of Slate and Talc in New Jersey During 1915.

There were three producers of slate during 1915, all in Sussex County.

There was one producer of talc, in Warren County.

The combined value for slate and talc for the year is \$11,017, which is a decrease of \$3,088 from the year before.

SAND AND GRAVEL.

Gravel, building sand and molding sand were the three most important products in this branch of the mineral industry. Burlington, Ocean, Middlesex and Cumberland counties, in the order named, were the chief producers, together contributing 75 per cent. of the total output. The wide distribution of commercial deposits is shown by the fact that seventeen counties were producers among the States. New Jersey stands fifth in value and sixth in tonnage in this source.

Production of Sand and Gravel in New Jersey, 1915.

<i>Variety.</i>	<i>Number of Producers.</i>	<i>Amount in Short Tons.</i>	<i>Value 1915.</i>	<i>Value 1914.</i>	<i>Increase or Decrease.</i>	
Molding sand,	31	509,187	\$331,792	\$237,788	\$94,004	I
Glass sand,	4	84,120	64,862	62,595	2,267	I
Building sand,	37	1,838,647	421,927	394,092	27,835	I
Grinding and polishing sand, ..	5	79,453	48,236	23,207	25,029	I
Fire or furnace sand,	12	53,113	37,184	33,367	3,817	I
Engine sand,	6	49,676	20,133	21,849	1,716	D
Paving sand,	7	160,256	53,559	39,902	13,657	I
Other sands,	8	81,095	22,476	59,089	36,613	D
Gravel,	31	2,112,557	447,388	672,433	225,045	D
Total,	82	4,968,104	\$1,447,557	\$1,544,322	\$96,765	D

PRODUCTION OF MINERAL WATER DURING 1915.

During the year 1915 New Jersey produced 1,479,479 gallons of mineral water, valued at \$116,226, being 230,551 gallons, or \$39,423 in value, less than the preceding year. Practically all of the output was sold for table water. There were thirteen active springs in the State. Of the nine producing counties, Bergen stood first with 71 per cent. of the total.

LIME.

In order to avoid duplication of values, stone used in making lime, chiefly for fertilizer and building purposes, is not included in the statistics of limestone in the stone industry but is reported separately.

In 1915 the output was 10,273 tons, as against 10,953 for 1914, valued at \$35,393, a decrease of \$5,833. The average value per ton in 1915 was \$3.45 per ton, as against \$3.76 in 1914. The lime was used chiefly for fertilizer and building purposes. Warren, Hunterdon, Somerset and Sussex counties are the chief producers in the order named.

MISCELLANEOUS.

Greensand Marl.—The possibilities of greensand marl as a source of potash and phosphatic acid for fertilizer have attracted considerable attention during the last year, and the State Geologist has received inquiries as to the location of commer-

cially available deposits. The actual production during 1915 was very small, amounting to only a few hundred dollars, and the material being dug entirely for local use.

Sand-lime brick.—The production of sand-lime brick was limited to one operator, located in Camden County.

Mineral paints.—Five companies reported the manufacture of mineral paints in New Jersey during 1915. Those were white lead (both dry and in oil), red lead, litharge, and lithophone, the latter being the most important in value.

Coke and by-products.—As for past years there was a large production of coke and its by-products by one concern located at Camden.

The output of coke and its by-products is combined with that of zinc ore, sand-lime brick, marl and mineral paints in order that the production of individual producers may be concealed. The total value of these products for 1915 was \$10,821,452, as against \$7,970,979 for 1914.



Fig. 7. Clean Roadsides are Both More Sightly and Safer than those Without Care.



Fig. 8. Swartswood Lake.



Fig. 9. Boundary Line Serves as a Fire Break on the State Forest Reserves.

Report of the State Forester.

C. P. WILBER, ACTING FORESTER.

In the enforced absence of the State Forester the preparation of the report which follows has fallen upon the writer, who is more familiar with the conduct of the forest fire work than with that of the State Forester in all its details. It may be, therefore, that some phases of the Forester's work will not receive the attention in this report which they would were he able to give it his personal attention.

Forestry in New Jersey, as everywhere, is fundamentally dependent on adequate protection from forest fires. The progress made in better fire prevention and control is dealt with in the State Firewarden's report (see p. 57). With this foundation building up more strongly year by year the commercial and æsthetic value of its forest areas to the State is annually increased. The prolific and spontaneous forest growth throughout the State assures a permanence to its protected woodlands (see Fig. 15). It also insures productiveness more than commensurate with the outlay required, despite the depleted and often inferior present condition of the forest because of long continued neglect and abuse. An area of nearly 2,000,000 acres of forest land (approximately 50 per cent. of the State's area), presents a conservation problem of very real economic importance among New Jersey's many interests and opportunities.

EDUCATION AND PUBLICITY.

Granted protection, each acre of woodland developed and improved by forestry practice is a new resource of public as well as private importance. Whether it be by reason of added timber production, stimulated labor markets, enhanced recrea-

tive value or æsthetic gain, forestry has found a permanent place in the State's needs.

The questions still remain in many minds: are our forest worth protecting, can they be developed to any real value and when conserved what can be done with them? The answer to these question is in each case definite and favorable. (See Fig. 15.) But constant effort must be made to reach the public with the facts and the reasons for them. The Fire Service has brought home, through its extensive system of local wardens, the fact that active measures are being taken in one phase of the work. There is an increasing frequency of requests for specific advice or assistance in forest, woodlot or shade tree problems. This is evidence that the previous ignorance and indifference is giving place to a realization of the need for and the value of a wider application of the principles of forestry and arboriculture.

The annual forestry exhibit of the Department at the Trenton Inter-State Fair, enlarged and revised this year, again attracted large interest and apparently aroused increased understanding. (See Figs. 10 to 14.) The effectiveness of this means of telling of the forestry work has been increasingly felt for several years. The facilities for taking advantage of it more generally have not been available. During the year small forestry displays of office and museum specimens and pictures have been loaned for use in Newark, East Orange, and in Summit in connection with municipal or educational exhibits. This season also it has been possible to prepare and segregate a larger traveling exhibit from the permanent display at Trenton. This exhibit was first set up at the Bergen County Fair and later at a general conference of boys at Atlantic City. It promises to find general favor and usefulness at county fairs, grange meetings, and similar gatherings in the future.

During the year there have been numerous opportunities to present the forestry work in lectures and informal talks. It has been possible to take advantage of many, though not all, of these.

The current "List of Firewardens" was published and dis-



Fig. 10.



Fig. 11.

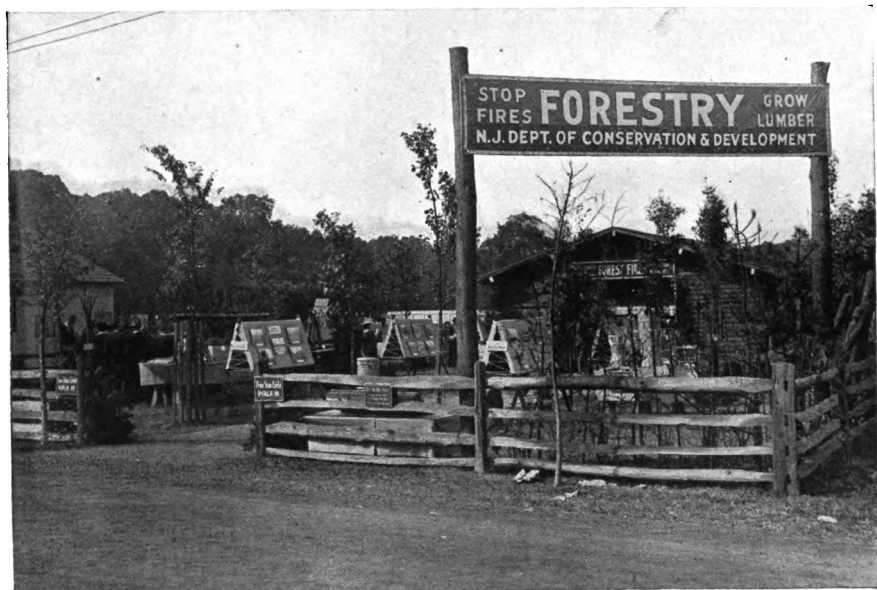


Fig. 12.



Fig. 13.

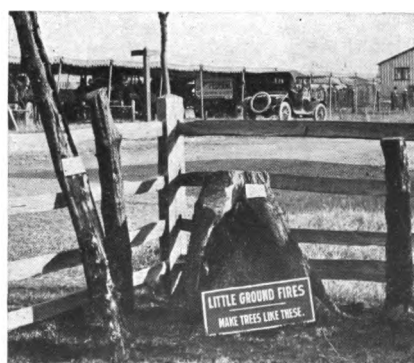


Fig. 14.

FORESTRY AT THE TRENTON STATE FAIR.

tributed widely, as heretofore. A special circular on the "Falling of Maple Leaves" and "A Program for Arbor Day" also have been issued to meet specific needs.

STATE FOREST RESERVES.

Continued protection from fire is yearly increasing the forest value of these properties. Some revenue is annually returned from them. With the exception of the Lebanon, where the fire risk is unusually great, none of the areas have suffered any injury in this way during the year. Development is gradually being pushed on all to render them more safe, more accessible, and more valuable. (See Figs. 7 and 9.) As this progresses their value as public recreation grounds is growing and their availability and suitability is becoming better known.

These areas are now and will become more and more of peculiar value for demonstration of what applied forestry does for woodlands, as they are more generally used as outing grounds.

The small Mays Landing Reserve, a 373-acre demonstration area, was sold during the year for \$8,264. The sale makes available this sum for acquisition of one or more new sites of larger area and more advantageous situation. By an understanding with the purchasers, the forest plantations already established will be maintained and protected until their experimental value has been outgrown, thereby assuring that the chief value which the property had will be realized.

A new property, the Jackson Reserve, and a material addition to the Stokes Reserve have been secured in the past year. The present area and location of these, and the previously acquired properties, are summarized below, with a brief outline of the condition and development of each.

Bass River Reserve—Warden, Samuel Budd Allen, New Gretna, 1,633 acres.

Is in Burlington County, six miles northwest of Tuckerton, and is typical of the so-called "pine barrens." A considerable number of experimental plantations and several well developed experimental thinnings are on it.

Jackson Reserve—Warden, Charles H. Thompson, Cassville, ... 42 acres.

Is a new area in Ocean County of unusual accessibility with a forest of nearly pure pine about 35 years old. It is admirably suited to cultural operations such as thinnings and will be so developed.

Lebanon Forest Reserve—Warden, Victor Bush, Pemberton, . . . 3,498 acres.

Is in Burlington County, nine miles southeast of Pemberton.

Several experimental plantations and more recent thinnings are on it, but it is used largely as a demonstration in fire control under particularly difficult conditions. Some fire damage has been suffered during the past year, and considerable since the acquisition of the property, but it is in better condition in every way than when it was acquired. A portion of the area is under agricultural development by the Burlington County Feeble-Minded Colony at Four Mile.

Mount Laurel Reserve—Warden, Harvey Darnell, Moorestown, 20 acres.

Is an isolated tract of hardwood and pine in Burlington County, three miles southeast of Moorestown. It is peculiarly accessible and susceptible to forest management, and because of very complete and successful thinnings and plantings five years ago, has unusual value as an example of applied forestry. (See Figs. 20-22.)

Penn Reserve—Warden, George L. Inman, Chatsworth, . . . 2,764 acres.

Is in Burlington County, six miles southeast of Chatsworth.

It is a tract of almost pure pine in the heart of the wilderness. The forest is much of it in better than average condition and affords a pointed example of the value of fire protection in developing timber growth under typical conditions in "the pines." (See Fig. 15.)

E. C. Stokes Reserve—Warden, Marcus F. Howell, Branchville, 6,731 acres.

Is in Sussex County, two and a half miles west of Branchville. It is typical of absolute forest land in North Jersey. Under fire protection it is rapidly developing in value. For recreative purposes it is the most suitably situated reserve, and it is hoped that it may be increasingly used in this way. Roads, trails, and camping sites are being provided as fast as facilities permit. The large farm house on the property has been made usable and is now the headquarters and residence of the warden. During the year title has been taken to 1,183 acres of the 1,500-acre addition previously contracted for, and it is expected that the transfer of the remaining 317 acres will shortly be effected.

Swartswood Reserve—Warden, Marcus F. Howell, Branchville, 560 acres.

Is in Sussex County, seven miles northwest of Newton. It consists of Swartswood Lake, with an area of 544 acres, and eight adjacent pieces of upland embracing 16 acres. It is maintained for the use of the public as a park and recreation spot. (See Fig. 3.)

Total, . . . 15,248 acres.



Fig. 15. Thrifty Natural Reproduction in Pitch Pine. Under Fire Protection All South Jersey's Forests Will Restock Like This.



Fig. 16. A Typical Hardwood Woodlot Marked for Thinning. Trees Young and Thrifty, but Too Crowded.



Fig. 17. Most Towns Might Turn Some Nearby Grove into a Valuable Recreation Ground at Slight Cost.



Fig. 18. Public Playgrounds Like this are Lying Idle Within the Reach of Many Communities.
TWO VIEWS IN A SMALL TOWN PUBLIC PARK—MOORESTOWN.



Fig. 19. Unattractive, Barren School Grounds, Which Could Easily and Economically Be Transformed by Well Placed Trees and Shrubbery.

A natural and desirable use of these properties is presented by the growing needs of the State's institutions for dependents. The colony now occupying a portion of the Lebanon Reserve has proven the mutual advantage of such use. Sufficient areas of arable land, and such seclusion as is necessary, are found on each of the larger properties. In addition, the protection and development of the woodlands offer work of every nature to the inmates, and material advantage to the forest.

STATE AIDED FORESTRY.

New Jersey's forest problem is and unquestionably will remain largely a woodlot question. Agricultural and urban development cannot fail to interrupt and curtail the forest areas. Such development is not adverse to but directly in line with the principles of forestry. Good forest practice neither advocates nor tolerates the reservation of soils, more productive otherwise than for growing woodlands, save where some outside public necessity demands permanent forest growth alone. Likewise forestry in the State undoubtedly will long remain a problem of the private owner in large part.

The situation thus presented precludes the regular employment of a forester by most owners. To meet this condition the department offers the services of its foresters, so far as their time will permit, to all who ask for them. To encourage and institute the practice of forestry, woodlot management, forest planting and forest fire protection problems are taken up, and properties visited when advisable and possible. The cost to the owner is the forester's actual expenses while away from Trenton, his salary being paid by the State. During the year a number of new areas have been brought under management in this way, and the work previously undertaken on others maintained. (See Fig 16.) Each such area has its own increased permanent value to the owner in addition to any incidental profit from the operation. It also provides another advocate in itself for the encouragement of other owners.

The most puzzling, and often the insuperable, barrier to forest management and woodland owners is the market problem.

Where forest fire protection is assured, forest development is attractive or repellant in proportion to the ease and profit of exploitation. To bring the user and producer together is another constant effort of the work. The local information available in the Department files for this purpose is yearly increasing by persistent inquiry and the continued coöperation of those who buy or sell forest products.

SHADE TREES.

Interest in this subject is rapidly awakening. Although not forestry proper, shade-tree work is an important adjunct, not only by reason of its own intrinsic value, but because through this avenue the attention and interest of many is first attracted to the larger forestry problem. Especially is this so of the children.

The most recent information lists 70 shade-tree commissions in active operation under the new 1915 law. Too few of these, however, are represented in the South Jersey communities, and particularly in those along the coast.

A phase of shade-tree work which is rapidly developing is the "school-beautiful" idea. Not every school is so situated that shade tree or ornamental planting is advisable or can be done. But on most school properties there is a place for such improvement. (See Fig. 19.) By careful planning, in coöperation with the local shade-tree authorities or with the State Department, bare, unattractive schools are disappearing. The expense need not be large nor the extra care become a serious added burden. The school so favored is both more attractive as a public asset and a source of pride and information to its pupils.

The powers of the department in this work are merely advisory and its facilities for active coöperation limited. However, it seeks to and in many instances during the year has been able to lend assistance to both municipal shade-tree commissions and private citizens. This has been done by visits and by correspondence upon questions of law, of policy and field practice.

The growing favor with which shade-tree work is constantly meeting raises the question of more general provision for trees



Fig. 20. Close Crowded Stand of Hardwoods.



Fig. 21. The Same Stand Immediately After Thinning. Thrifty, Well-Formed Trees Only Left.



Fig. 22. The Same Stand Six Months Later. Tree Crowns Already Beginning to Furnish Ample Shade with Stronger Growth.
A TYPICAL WOODLOT BEFORE AND AFTER A PROFITABLE AND BENEFICIAL THINNING.

along all highways. This movement for rural shade-tree work has already become a live question in some neighboring states. With present facilities and existing legislation, no general endeavor to move in the matter seems possible. However, it is surely fitting that a state so forward in highway development should not lag in this respect. It is hoped that during the coming year some definite beginning may be made to establish and conserve roadside shade trees.

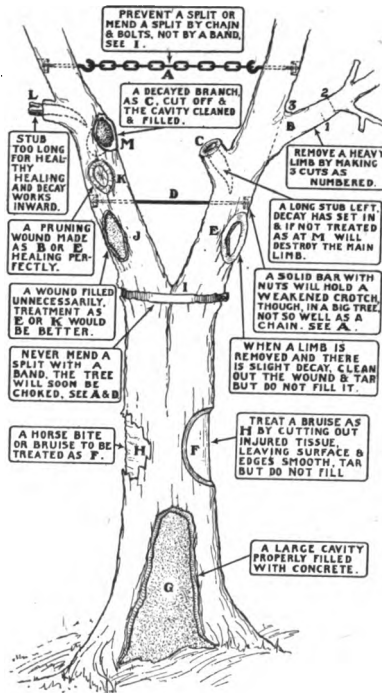


Fig. 23.

TREE PESTS.

Conditions in New Jersey respecting tree enemies are generally encouraging. The serious menaces of insects and diseases, which prevail in or threaten several nearby states, so far have been either kept out of the state or immediately suppressed. Except for the chestnut blight no widespread or serious enemy

appears to have a grip on the local situation. It cannot be too emphatically urged that rigid care in the importation of foreign materials be maintained. Only by hearty private coöperation with those in charge of plant inspection can our forest and shade trees eventually be spared some serious scourge.

The past season has been a particularly favorable one for insects. The Tussock moth, the Tent caterpillar and the Striped Oak worm have thriven on the heavy foliage induced by spring rains. Despite the ease with which they can be controlled, their work is too generally ignored. Although unfortunate, this is, perhaps, to be expected because their ravages are local rather than epidemic. The aggregate harm done is considerable, but the individual infestations are seldom acute enough to arouse local interest in their control. The Hickory Bark beetle has continued to remove weakened trees. It does not menace thrifty hickories, however, and, by proper attention to their nourishment, threatened trees can usually be preserved.

The chestnut blight shows little if any decrease in its vigor, and continues to make havoc in this species. In August, state-wide inquiries and complaints were made because of the failing of lawn and shade trees by general defoliation. Investigation showed that no disease or insect was at work, but that, because of heavy spring rains and a wet summer, the leafage produced was too great for the root systems to support. A circular published described the only treatment possible by fertilizer application and proper pruning. No permanent injury should result in general where such safeguards were applied.

Advice and coöperation are gladly given to any concerned either directly or in collaboration with the State Entomologist and State Plant Pathologist. Do not employ unknown tree doctors.

Report of the State Firewarden.

CHARLES P. WILBER.

THE FIRE SEASON.

November, 1915, the first month of the official year, as usual, ushered in a period of dry weather. Added to this were high winds, the dangerous forest fire conditions due to the fall season and the advent of the gunning season. Though by no means as aggravated as that of the previous year, the situation in the year just closed gave serious trouble. Fourteen per cent. of the year's total fires had burned between November 1st and December 1st.

The midwinter months, December, January and February, as usual, were productive of but few fires of any sort and none of serious importance.

An unusually favorable condition in March continued the winter's freedom from fires beyond the normal period, so that after the close of the preceding November there were no large fires until the opening of April.

The months of April and May developed the scourge of forest fires which annually attends this season. Unusually delayed foliage, frequent high winds, the customary widespread use of fire in "cleaning up" for spring work prevailed. Combined with the usual spring drought these factors produced 48% of the total number of fires recorded for the year, and 63% of all the fires which burned 200 acres or more.

During June and July unusually frequent, though not abnormally heavy, rainfall resulted in a small number of fires, none of which assumed serious size. The two following months, August and September, on the other hand, developed weather conditions quite the contrary. The first month is named in the

official weather record as the driest August since 1885, when the first systematic record was begun, and in September these conditions continued, though slightly less acute. Despite the menace thereby created, there were but 8% of the year's total number of fires recorded in this period. Only one of these burned as many as 200 acres:

October was an unusually bright, clear month, with less than normal rainfall, though no severity of drought. However, the fall conditions again prevailed, and 12% of the total fires for the year burned during the month. A number reached very destructive size, one burning an area of 8,600 acres.

A summary of the year, therefore, brings out clearly a situation so often heretofore remarked. The fall months November and October, with their customary physical conditions favoring fires and with the advent of the open season for game, are shown this year to have produced 26% of all the fires. The spring season, as usual, developed a severe drought. This, with the last year's fallen leaves, the immature foliation of the coming season, and the careless, reckless or ignorant use of fire so universal in these months, created a severe forest fire period.

That physical conditions are not the only, or indeed the major, factor in producing such situations is evidenced again this year. Only one fire, which burned as much as 200 acres, and but 8% of the total fires occurred during the severe late summer drought. In contrast, under not greatly aggravated natural conditions, the two short seasons in which the human factor is emphasized, produced three-quarters of all fires reported and every serious fire. This clearly indicates a personal, not climatological, condition of responsibility.

FIREWARDEN'S REPORT.

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Table I—Forest Fires in 1916, and in Previous Years.

Year.	No. of Fires.	Total Acres Burned.	Acres per Fire.	Total Loss.	Loss per Fire.
No organized service, incomplete reports.					
1872,		100,000		\$1,000,000	.....
1880,	54	71,074	1,316	252,240	\$4,671
1885,		128,000		1,128,000	.....
1895,	49	66,120	1,349	600,000	12,245
1902,	65	98,850	1,520	169,323	2,605
1903,	79	85,046	1,076	305,744	3,870
1904,	81	41,530	512	193,413	2,388
Organized fire service.					
1907,	167	11,525	69	11,647	70
1908,	533	52,978	100	64,536	121
1909,	563	93,525	166	133,944	238
1910,	611	81,452	133	127,850	209
1911, Forest Fires,	289	64,404	122	86,940	165
Embryo Fires,†	239				
1912, Forest Fires,	214	26,291	48	21,501	39
Embryo Fires,†	331				
1913, Forest Fires,	311	53,823	77	67,205	99
Embryo Fires,†	367				
1914, Forest Fires,	396	78,655	92	83,880	99
Embryo Fires,†	451				
1915, Forest Fires,	549	150,258	147	209,090	207
Embryo Fires,†	467				
1916, Forest Fires,	269	51,654	88	69,001	118
Embryo Fires,†	314				

† Burned less than 5 acres.

NUMBER AND AREA OF FIRES.

(See Tables I and II.)

Despite the conditions described above, the Fire Service is evidently taking an increasing grip on the problem.

For the preceding five years the number of fires reported has shown a steady annual increase. This has been felt to register increasing activity and thoroughness in attending and reporting fires, not a discouraging failure to improve conditions. That this situation would not continue was felt certain, and this assurance is apparently justified by the summaries of the past season. Under conditions by no means more favorable than

average, and in the face of records more complete than any heretofore, the total number of fires which started in the State has been markedly less than formerly. (See Table I.) Moreover, the proportion of fires which were put out before they burned an area of five acres is larger than in either of the two years previous. Further, of 314 such fires, 68% were controlled, while still burning over open fields, before they reached the forest which they threatened. Only 8% of the year's total number developed into fires of real seriousness, as against 12% in each of the two seasons previous.

The total area burned-over in the current year was 51,654 acres. This is the lowest figure recorded since 1908, with the exception of the unusually favorable season of 1912. Of this total, 40,350 acres were burned in the spring and the two fall seasons described above. (See p. 57.) Also almost 26,000 acres, or more than half the total acreage, was burned by eight fires. These occurred in these same seasons on days when high winds made the control of any blaze most hazardous. Further, they started in locations whose remoteness and difficulty of access made them very difficult problems.

FIREWARDEN'S REPORT.

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Table II—Forest Fires by Relative Area Burned, and by Counties, 1916.

COUNTY.	NUMBER OF FOREST FIRES.					Total Embryo Fires (less than 5 acres).
	5-10 Acres.	11-100 Acres.	101-1000 Acres.	Over 1000 Acres.	Total.	
<i>North Jersey—</i>						
Bergen,	5	1	1	.....	7	10
Hunterdon, .....	.....	.....	.....	.....	.....	.....
Morris,	6	10	2	.....	18	28
Passaic,	7	5	.....	.....	12	12
Somerset,	2	3	.....	.....	5	6
Sussex,	2	7	1	.....	10	14
Union, .....	.....	1	.....	.....	1	2
Warren,	1	3	.....	.....	4	12
Fires that burned in more than 1 county, .....	.....	.....	.....	.....	.....	.....
Totals,	23	30	4	.....	57	84
<i>South Jersey—</i>						
Atlantic,	9	33	8	2	52	64
Burlington,	4	16	7	.....	27	20
Camden,	9	8	5	.....	22	41
Cape May,	2	4	2	.....	8	17
Cumberland,	12	13	6	1	32	22
Gloucester,	1	13	3	.....	17	4
Mercer,	1	.....	.....	.....	1	.....
Middlesex,	3	5	1	1	10	7
Monmouth,	7	3	4	.....	14	14
Ocean,	4	15	3	1	23	38
Salem, .....	.....	4	.....	.....	4	3
Fires that burned in more than 1 county, .....	.....	1	.....	1	2	.....
Totals,	52	116	40	6	212	230
State Totals,	75	146	44	6	269	314
Per cent. of State Totals,	13	23	7	1	46	54

CAUSES OF FIRES.

(See Table III.)

Railroads.

The percentage of fires known to have been caused by railroads is 38%. This is somewhat higher than in the two previous years, but the actual number is far less. Moreover, the proportion of fires from this cause, which are allowed to become true forest fires, annually grows lower. This season 70% of the railroad fires did not burn 5 acres, whereas 50% of the fires in each other class exceeded this acreage. This emphasizes two things: first, that a major cause of forest fire, when known and of reasonably fixed location, is a problem being controlled; second, that the active interest of those in charge of the railroad rights of way each year is more helpful to wardens in keeping railroad fires to small size. It is again repeated, however, that until an equal interest develops in the departments maintaining and operating the locomotives, the preventive measures, which alone will remove the menace, cannot be looked for.

Brush Burning.

Strict administration of the Permit law for brush burning apparently is bearing fruit in a reduced number of forest fires so started. This year the proportion of fires known to have come from brush burnings is 3% less than a year ago, and is but 10% of the total number. The number of fires which are known to have originated from this cause is less than half that of the preceding year, although the period, when such use of fire is commonest, was a season little less dangerous than in the previous year. Of the 59 fires reported from this cause, personal responsibility has been fixed for 44. This persistent determination of responsibility, with the consequent corrective measures and the closer regulated use of fire under the Permit law, is annually reducing the fire loss from this cause. (See Frontispiece.)

Smokers.

Proportionately the number of fires known to have been caused by careless smokers remains approximately the same from year to year. The difficulty of reaching the responsible individual in the majority of cases is plainly evident when the universal and transient character of the menace is considered. It is again repeated that the territory involved is so large, and the smokers so often indifferent or ignorant of the menace they present, that preventing such fires is not possible in the way known or fixed menaces are controlled. The fires listed from this cause are known to be by no means a complete statement of those so started. A large proportion of the "unknown" column annually hides the identity of smokers' fires. The individual smoker must be rendered conscious of his personal responsibility, and it is only through persistent educational effort that this can be done.

Sportsmen.

An unfortunate anomaly is annually presented by analysis of the year's fires. Those whose sport depends upon the protection of the forest areas from fire persist in a material responsibility for the destruction of their playground. With the more accurate information from year to year available, the proportion of fires definitely chargeable to those who thus use the woodlands for sport grows. Although they are unquestionably many instances in which both the illegal and unsportsmanlike use of fire by gunners cause forest fires, yet by far the greater part of sportsmen's fire are due to carelessness or ignorance. Lighted matches and tobacco are discarded, and camp fires are left burning with no thought of the damage they may do. Like the smokers' fires this class also presents the transient and widespread characteristics discussed in the paragraph above. Persistent and widespread activity in patrolling the more frequented localities in October developed a more certain knowledge of one phase of the question. This effort, with its continuance, will undoubtedly, in large measure, reduce the illegal, dangerous, and unnecessary use of camp fires. But the gunner who smokes in the woods cannot

be so specifically reached. Fires so caused will continue until the spirit of personal responsibility can be stirred in the individual man.

Miscellaneous Causes.

In number and in their proportion to the total, the fires started by various other known causes are less than heretofore. In many instances such fires arise from causes which cannot be foreseen and provided against, as those which come from burning buildings. In others set by children at play, stationary engines, etc., preventive measures can be taken, and the fires so started are becoming fewer each year.

FIREWARDEN'S REPORT.

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Table III—Forest Fires by Causes and Counties, 1916.

COUNTY.	NUMBER.														Totals.
	Locomotive.		Brush Burning.		Smokers.		Sportsmen.		Miscellaneous.		Unknown.				
	FF	eF	FF	eF	FF	eF	FF	eF	FF	eF	FF	eF	FF	eF	
<i>North Jersey—</i>															
Bergen,	2	4				2	1		1	1	3	3	7	10	
Hunterdon,															
Morris,	7	6	2	1	1	4	6	5		1	2	11	18	28	
Passaic,	2	6		1		1	6	4			4		12	12	
Somerset,				2		1	1			1	4	2	5	6	
Sussex,	4	9	2	2			2	2			2	1	10	14	
Union,				1						1	1		1	2	
Warren,	2	10						1			2	1	4	12	
Fires that burned in more than 1 county,															
Totals,	17	35	4	7	1	8	16	12	1	4	18	18	57	84	
<i>South Jersey—</i>															
Atlantic,	8	42	6	3	8	3	4	3	4	3	22	10	52	64	
Burlington, ..	7	8	3	1	1	2	1		1	2	14	7	27	20	
Camden,	10	28	2	4	1	1	2		2	3	5	5	22	41	
Cape May,	3	8				3	1	3	1	1	3	2	8	17	
Cumberland, ..	3	6	6	4	4	2	3		3	1	13	9	32	22	
Gloucester, ..	3		4	3	3	1			3		4		17	4	
Mercer,							1						1		
Middlesex, ...	2				3	1	1			1	4	5	10	7	
Monmouth, ...	4	6			5	3		1	2	2	3	2	14	14	
Ocean,	9	21	4	5	3	3	2	1		1	5	7	23	38	
Salem,		1	2	1			1	1			1		4	3	
Fires that burned in more than 1 county,	1										1		2		
Totals,	50	120	27	21	28	19	16	9	16	14	75	47	212	230	
State Totals,	67	155	29	27	29	27	32	21	17	18	93	65	269	314	
Per cent. of State totals, ..	38		10		10		9		6		27		.....	

FF—Forest Fires.

eF—Embryo Fires (less than 5 acres).

THE FOREST FIRE SERVICE.

(See Map.)

The State Force.

To meet changing conditions in the administration of the work, the previous organization has been rearranged. Under this change the former apportionment of the State into four divisions was altered to create three such units. The new scheme has made no reduction in the force, but rendered it more flexible and apparently more effective. The work as now organized makes no change in the north Jersey area, but has redrawn the previous lines in the southern area so that the system now provides one Division Warden, with headquarters at Trenton, available for the entire State, and a field force as follows:

Division A. Headquarters, Dover.

Comprising: Bergen, Essex, Hudson, Hunterdon, Morris, Passaic, Somerset, Sussex, Union and Warren counties, and Middlesex county north of the Raritan river.

Division B. Headquarters, Lakehurst.

Comprising: Burlington, Mercer, Monmouth and Ocean counties, and Middlesex county south of the Raritan river.

Division C. Headquarters, Hammonton.

Comprising: Atlantic, Camden, Cape May, Cumberland, Gloucester and Salem counties.

Such arrangement was made possible because of the standard of efficiency attained by the local service after five years of administration under the enlarged force of State wardens. The season's work again has further strengthened the local service, provided, by no means adequate, but fuller patrol for fires and shown further effectiveness in handling violations of the law.

Local Organization.

The large expansion in territory in the previous year provided organized effort for forest protection in most of the municipalities where conditions seemed to justify or require wardens. There has, therefore, been no attempt to install them in additional townships during the past year. However, to meet immediate local demand the service was instituted in Washington Township, Gloucester County. With this addition the work now embraces 143 municipalities, with 327 wardens, an increase of 17 in the number of men enlisted.

The rising proportion of the fires which start that are extinguished before they attain appreciable size is the most significant indication of the activity and effectiveness of this force. Its growing usefulness is further shown by the readier fixing of responsibility for the fires, a larger share of credit for which annual improvement rests with the local wardens. Stability in the local force has been the keynote toward which the administration of the work has aimed. Continuous effort to replace incompetent or uninterested men by more effective wardens has been necessary since the work first was organized, but each year a larger proportion of efficient wardens has been continued in the service. Although not every district is now served by a satisfactory warden, the proportion of those undesirable has grown small. To further this stability the last Legislature increased the term of service from one to three years. This not only makes for greater permanence in organization, but removes from the Department the heavy administrative burden of the annual reorganization heretofore necessary.

During the year an increased number of both warning and information posters have been placed by the local force. Also each warden has been furnished with an attractive permanent notice to mark his headquarters or the place where word may be left to reach him promptly.



Fig. 24.

A new and very valuable coöperation is that offered by the Bell Telephone Company. Under the plan proposed, one warden available by telephone is now listed with each central operator in the forest sections. Any forest call, unless made for some specific warden, is referred to this one man for personal attention or transmission to the warden in whose territory the fire is burning.

With the rapid increase in the proportion of local wardens available by telephone, this provides both the native and the transient with a means of reaching help promptly and effectively for all fires.

Rural Mail Patrol.

This year the service rendered by rural mailmen has been of increased value. The designation of all such employees as patrolmen by the United States Post Office Department in 1912 upon suggestion from the New Jersey Forest Commission has continued. As the wardens and patrolmen yearly coöperate more closely, prompt notice of small fires, which otherwise might have been serious, becomes more frequent.

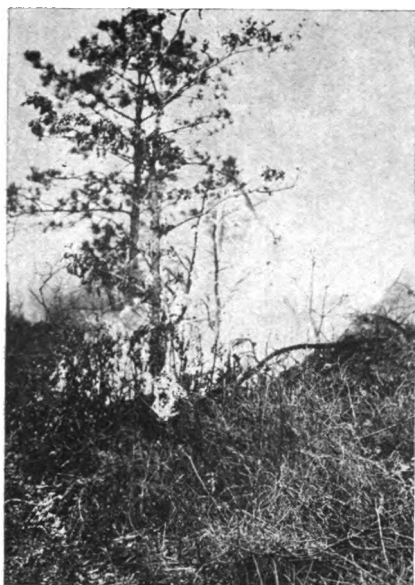


Fig. 25. One Carelessly Dropped Match or Cigarette May Mean This.



Fig. 26. The Little Ground Fires Make Trees Like This.

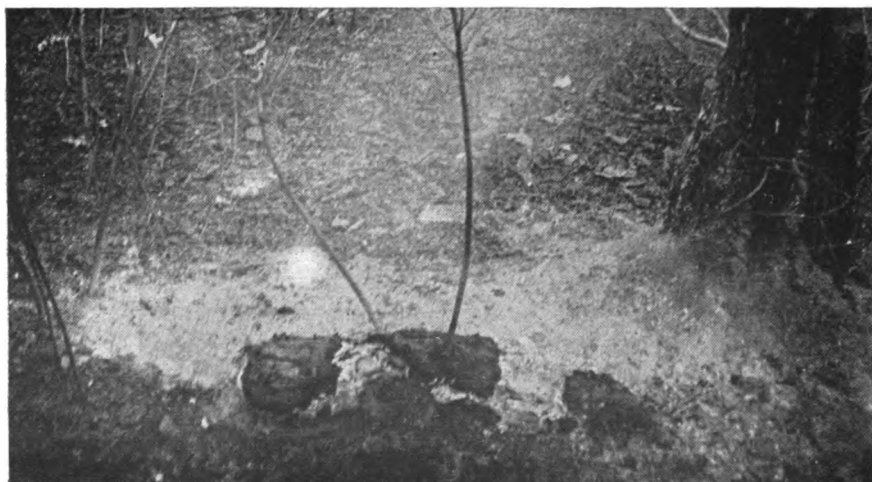


Fig. 27. Fires Must be Patrolled When the Fighting is Done. This Ember Was Burning 5 Hours After the Fire Passed.

Federal Patrol.

Under the so-called Weeks Law the \$2,000 fund annually allotted to this State from the Federal Government for forest fire patrol was continued. As provided by the law the coöperation is only available in the northern portion of New Jersey. In areas under the control of this auxiliary service, fires have been fewer year after year, and the few that do start are not assuming serious proportions. The value of the facilities afforded, both as a fire deterrent and for fire control, has been still further attested by the past season's work. The improved conditions are unquestionably due in part to the increasing efficiency of the local warden service and to the state-wide awakening of public interest. But the patrol has had a virile share both in helping wardens to a greater efficiency and in stimulating the public interest, and coöperation above that, in many territories, not so favored.

The tower equipped by the Newark City Board of Works for lookout service having become unfit for use, the City Board has erected a new structure to replace it. (See Fig. 29.) This station at Cedar Pond, on the city's watershed, has been occupied from April till the middle of November by a lookout watchman.

With the opening of the spring season in April two patrolmen began service. One mounted man served in the territory most dangerous in Passaic and Sussex counties, continuing during the entire year. One man using an automobile patrolled areas in Hunterdon, Morris and Somerset counties, later being transferred to sections of Morris, Sussex and Warren counties, where he continued until the middle of July. When the gunning season opening in the fall an additional force of 10 men were installed to cover the more troublesome situations completely for that period.

Value of the Service.

Few, if any, fires start in such locations or under such conditions that their control is not an economic gain. Few are so innocent of harm that there is no measurable salvage when they are promptly stopped. Vast woodland areas are surely known

to owe their preservation to the wardens and their helpers yearly. However, because of the vagaries of forest fires and the uncertainty of what the capacity of the smallest blaze might be if unattended, the closest estimate of forest values saved by the Fire Service each year could be but vague. But large and definite record of service rendered is possible each year, in addition to the woodland values conserved. The wardens and their helpers in the discharge of regular fire-fighting duties have in the last year saved improved property to the value of more than \$200,000. Seventy-seven homes, 5 industries, 1 church, 2 school houses and 87 miscellaneous buildings are among the listed properties which owe their preservation to the Fire Service. To these are added more than 1,200 acres of cranberry bogs and a large quantity of forest products and agricultural crops.



Fig. 28. A Lookout Watchman Insures Prompt Discovery and Attack for Every Fire.

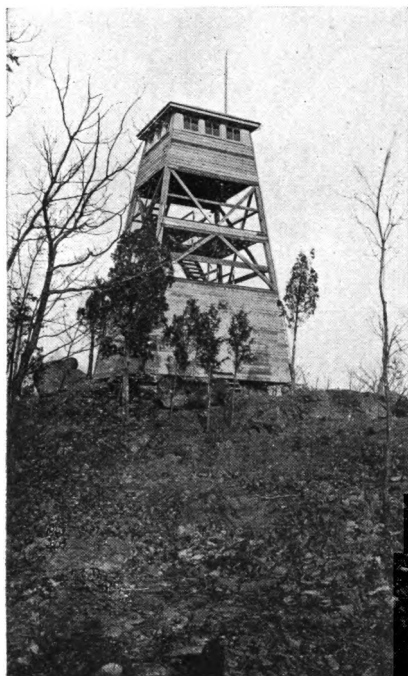


Fig. 29. Newark's New Forest Fire Lookout Station.

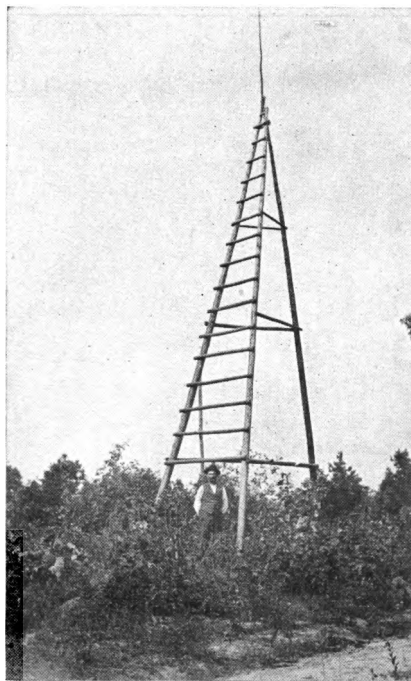


Fig. 30. Such a Lookout is a Valuable Help to the Local Warden.

FOREST FIRE LOOKOUTS.

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FIREWARDEN'S REPORT.

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Table IV—Forest Fires by Counties and Townships, 1916.

County and Township.	Number.		Acres Burned.	Loss to Forests and Other Property.	Cost to Extinguish.	Paid by.†		
	Forest Fires.	Embryo Fires.				Township.	State.	Offenders.
<i>Atlantic County—</i>								
Absecon (City), ..	1	....	10	\$10	\$12.00	\$6.00	\$6.00	.....
Buena Vista,	5	9	135	150	53.00	14.63	14.62	\$28.75
Egg Harbor,	2	2	150	75	63.25	30.63	30.62	5.00
Egg Harbor (City),	1	1	10	10	15.00	7.50	7.50	.....
Folsom, .....	...	2	.....	175	13.50	6.75	6.75	.....
Galloway,	5	19	270	275	137.55	35.65	35.65	67.00
Hamilton,	16	5	2,660	2,605	264.15	124.32	124.33	15.50
Hammonton,	4	13	625	625	126.30	23.67	23.68	80.00
Linwood,	1	....	40	40	20.00	10.00	10.00	.....
Mullica,	10	7	688	615	138.00	28.69	28.71	100.25
Northfield (City),	...	...	.....	.....	.....	.....	.....	.....
Pleasantville, .....	...	1	.....	20	21.60	10.80	10.80	.....
Port Republic, .....	...	...	.....	.....	.....	.....	.....	.....
Weymouth,	13	7	8,196	8,880	327.46	122.73	127.73	75.40
Total,	58	66	12,784	\$13,480	\$1,191.81	\$421.37	\$426.39	\$371.90
<i>Bergen County—</i>								
Franklin,	1	2	8	\$5	\$21.00	\$10.50	\$10.50	.....
Hohokus,	3	....	261	510	103.25	51.62	51.63	.....
Montvale (Boro.),	1	1	5	5	.....	.....	.....	.....
Oakland (Boro.),	1	6	12	15	28.75	8.88	8.87	\$11.00
Park Ridge (Boro.)	1	1	10	10	6.00	.....	.....	6.00
Ridgefield (Boro.),	...	...	.....	.....	.....	.....	.....	.....
Woodcliffe Lake, ..	...	...	.....	.....	.....	.....	.....	.....
Total,	7	10	296	\$545	\$159.00	\$71.00	\$71.00	\$17.00
<i>Burlington County—</i>								
Bass River,	1	....	8	\$10	\$11.20	\$3.10	\$3.10	\$5.00
Evesham,	1	....	30	30	15.20	7.60	7.60	.....
Medford,	4	4	174	680	163.50	81.76	81.74	.....
New Hanover,	1	1	10	10	15.00	7.50	7.50	.....
Pemberton,	5	8	200	255	101.55	15.36	15.34	95.85
Shamong,	6	2	1,555	2,000	128.70	22.50	22.50	83.70
Southampton,	1	1	150	200	31.80	15.90	15.90	.....
Tabernacle,	2	....	800	700	31.60	10.50	10.50	10.60
Washington,	5	3	885	5,030	190.20	95.10	95.10	.....
Woodland,	6	1	1,150	1,200	88.60	10.70	64.00	13.90
Total,	32	20	4,962	\$10,115	\$777.35	\$270.02	\$323.28	\$209.05

Table IV—Forest Fires by Counties and Townships, 1916—Continued.

County and Township.	Number.		Acres Burned.	Loss to Forests and Other Property.	Cost to Extinguish.	Paid by.†		
	Forest Fires.	Embryo Fires.				Township.	State.	Offenders.
<i>Camden County—</i>								
Berlin,	1	1	12	\$10	\$12.00	\$6.00	\$6.00	.....
Chesilhurst (Boro.)		3			33.45	16.72	16.73	.....
Clementon,	5	2	229	245	58.75	18.37	18.38	\$22.00
Delaware,	1		7	10	14.16	7.08	7.08	.....
Gloucester,	3	1	161	75	43.75	21.87	21.88	25.00
Voorhees,		2			4.00		2.00	.....
Waterford,	1		100	100	11.60	5.80	5.80	.....
Winslow,	12	32	1,654	1,914	386.60	90.99	91.01	224.60
Total,	23	41	2,163	\$2,354	\$564.31	\$168.83	\$168.88	\$271.60
<i>Cape May County—</i>								
Dennis,	1	6	600	\$430	\$46.60	\$13.80	\$13.80	\$19.00
Lower,		4			18.00	5.50	5.50	7.00
Middle,	4	5	236	242	74.90	27.45	27.45	20.00
Upper,	1	2	20	20	23.60	9.00	9.00	5.60
Woodbine (Boro.),	2		90	65	26.60	13.30	13.30	.....
Total,	8	17	946	\$757	\$189.70	\$69.05	\$69.05	\$51.60
<i>Cumberland County—</i>								
Commercial,	2		58	\$90	\$12.45	\$6.22	\$6.23	.....
Deerfield,	3	1	45	115	25.50	9.50	9.50	\$10.00
Downe,	1	1	5	10	17.00	8.50	8.50	5.00
Fairfield,	3		835	1,635	111.00	55.50	55.50	.....
Landis,	12	11	3,692	3,792	274.10	121.52	121.58	45.00
Lawrence,	1		93	100	30.70	15.35	15.35	.....
Maurice River,	7	2	3,696	6,545	378.21	118.82	145.74	163.65
Millville (City),	9	7	891	1,110	217.40	94.69	94.71	28.00
Total,	38	22	9,315	\$13,397	\$1,066.36	\$430.10	\$457.11	\$251.65
<i>Gloucester County—</i>								
Clayton (Boro.), .....								.....
Elk,	2		32	\$25	\$14.00	\$2.50	\$2.50	\$9.00
Franklin,	7	1	155	155	56.40	18.77	18.78	35.00
Monroe,	8	3	713	915	148.13	56.54	62.59	40.00
Washingtont, .....								.....
Total,	17	4	900	\$1,095	\$218.53	\$77.81	\$83.87	\$84.00
<i>Hunterdon County—</i>								
Bethlehem,
Lebanon,
Tewksbury,
Total,

FIREWARDEN'S REPORT.

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Table IV—Forest Fires by Counties and Townships, 1916—Continued.

County and Township.	Number.		Acres Burned.	Loss to Forests and Other Property.	Cost to Extinguish.	Paid by:†		
	Forest Fires.	Embryo Fires.				Township.	State.	Offenders.
<i>Mercer County—</i>								
Princeton,	1	.....	5	\$5	\$5.00	\$2.50	\$2.50	\$5.00
Total,	1	.....	5	\$5	\$5.00	\$2.50	\$2.50	\$5.00
<i>Middlesex County—</i>								
East Brunswick, ...	2	1	230	\$250	\$21.00	\$10.50	\$10.50	.....
Madison,	1	4	1,100	430	261.80	130.90	130.90	.....
Monroe,	2	1	55	110	23.20	11.60	11.60	.....
Sayreville,	5	1	143	145	43.75	21.87	21.88	.....
South Brunswick, ..	.....	.....	.....	.....	.....	.....	.....	.....
Total,	10	7	1,528	\$935	\$349.75	\$174.87	\$174.88	.....
<i>Monmouth County—</i>								
Atlantic,	2	2	440	\$400	\$33.00	\$7.50	\$7.50	\$18.00
Freehold,	3	1	290	405	82.35	41.18	41.17	.....
Howell,	8	7	408	475	276.17	124.86	124.86	31.45
Middletown, .....	.....	.....	.....	.....	.....	.....	.....	.....
Shrewsbury,	4	4	240	1,170	55.20	25.60	25.60	4.00
Wall,	1	.....	100	150	5.50	2.75	2.75	.....
Total,	18	15	1,478	\$2,600	\$452.22	\$201.89	\$201.88	\$53.45
<i>Morris County—</i>								
Boonton, .....	.....	1	.....	.....	\$5.00	\$2.50	\$2.50	.....
Chester,	2	2	52	\$25	43.80	13.90	13.90	\$16.00
Denville,	2	2	160	200	54.00	25.50	25.50	3.00
Hanover, .....	.....	1	.....	.....	5.00	2.50	2.50	10.00
Jefferson, .....	.....	4	.....	.....	26.00	11.00	11.00	4.00
Mendham,	1	1	70	100	7.00	3.50	3.50	.....
Montville,	1	1	15	25	12.75	3.87	3.88	5.00
Morris, .....	.....	2	.....	.....	2.50	1.25	1.25	.....
Mt. Arlington,	1	1	10	50	5.50	1.50	1.50	2.50
Mt. Olive, .....	.....	1	.....	.....	7.40	3.70	3.70	.....
Passaic, .....	.....	.....	.....	.....	.....	.....	.....	.....
Pequannock,	3	2	49	90	83.00	7.50	7.50	57.50
Randolph,	3	.....	80	110	27.00	7.50	7.50	12.00
Rockaway,	5	8	458	307	155.48	70.35	70.38	14.75
Roxbury,	4	1	156	165	18.70	7.15	7.15	3.40
Washington, .....	.....	1	.....	.....	2.50	1.25	1.25	.....
Total,	22	28	1,050	\$1,072	\$455.63	\$162.97	\$163.01	\$128.15

Table IV—Forest Fires by Counties and Townships, 1916—Continued.

County and Township.	Number.		Acres Burned.	Loss to Forests and Other Property.	Cost to Extinguish.	Paid by.†		
	Forest Fires.	Embryo Fires.				Township.	State.	Offenders.
<i>Ocean County—</i>								
Berkeley,	2	2	890	\$5,600	\$118.62	\$4.00	\$4.00	\$115.62
Brick, .....	...	3	...	...	15.00	7.50	7.50	...
Dover,	4	1	960	1,110	98.45	39.43	39.42	23.00
Eagleswood, .....	...	...	...	...	5.00	2.50	2.50	...
Jackson,	3	4	55	580	48.75	24.38	24.37	30.00
Lacey,	2	12	3,250	3,250	138.20	13.43	13.42	119.35
Lakewood,	4	4	910	965	115.30	54.77	54.78	20.75
Little Egg Harbor,	1	1	10	10	37.80	18.90	18.90	...
Manchester,	9	8	2,092	2,705	174.64	48.32	48.32	58.00
Ocean,	2	...	2,265	2,600	62.40	31.20	31.20	...
Plumstead, .....	...	1	...	...	...	...	...	5.00
Stafford,	1	...	600	600	44.37	22.18	22.19	...
Union,	4	2	3,739	3,580	239.24	119.62	119.62	...
Total,	32	38	14 771	\$21 000	\$1,097.77	\$386.23	\$386.22	\$371.72
<i>Passaic County—</i>								
Pompton,	9	3	305	\$364	\$126.10	\$64.55	\$64.55	...
West Milford,	3	9	22	30	64.25	9.87	11.13	\$43.25
Total,	12	12	327	\$394	\$190.35	\$74.42	\$75.68	\$43.25
<i>Salem County—</i>								
Alloway,	1	1	30	\$60	\$24.00	\$12.00	\$12.00	...
Lower Alloways Creek,	1	...	20	20	16.00	...	...	\$16.00
Pittsgrove,	2	...	72	60	27.40	7.20	7.20	15.00
Quinton, .....	...	1	...	...	5.00	2.50	2.50	...
Upper Pittsgrove, ..	...	1	...	...	2.00	...	...	5.00
Total,	4	3	122	\$140	\$74.40	\$21.70	\$21.70	\$36.00
<i>Somerset County—</i>								
Bernard, .....	...	4	...	...	\$45.00	\$19.50	\$19.50	\$6.00
Bridgewater,	2	1	110	\$100	50.25	25.13	25.12	10.00
North Plainfield, ..	3	...	54	40	25.00	12.50	12.50	...
Warren, .....	...	1	...	...	6.00	3.00	3.00	...
Total,	5	6	164	\$140	\$126.25	\$60.13	\$60.12	\$16.00
<i>Sussex County—</i>								
Andover,	2	\$10.00	\$5.00	\$5.00	...
Byram,	1	8	40	\$10	61.50	23.25	23.25	\$15.00
Frankford,
Franklin (Boro.),

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Table IV—Forest Fires by Counties and Townships, 1916—Continued.

County and Township.	Number.		Acres Burned.	Loss to Forests and Other Property.	Cost to Extinguish.	Paid by.†		
	Forest Fires.	Embryo Fires.				Township.	State.	Offenders.
<i>Sussex County—Con.</i>								
Green,	1		20	\$50	\$11.60			\$12.00
Hampton,	4	2	46	60	40.10	\$6.05	\$6.05	28.00
Hopatcong,	1		500	500				
Montague,	1							
Ogdensburg (Boro)								
Sandyston,	1	1			15.20			15.20
Sparta,	1		20	20	2.00			2.00
Stillwater,								
Vernon,	2	1	105	125	33.50	16.75	16.75	
Walpack,								
Wantage,								
Total,	10	14	731	\$765	\$173.90	\$51.05	\$51.05	\$72.20
<i>Union County—</i>								
Fanwood,	1		35	\$35	\$15.00	\$4.00	\$4.00	\$7.00
Mountainside,								
New Providence, ..		1			2.00	1.00	1.00	
Springfield,		1			2.60	1.30	1.30	
Total,	1	2	35	\$35	\$19.60	\$6.30	\$6.30	\$7.00
<i>Warren County—</i>								
Allamuchy,	1		25	\$25	\$25.00	\$12.50	\$12.50	
Blairstown,								
Franklin,								
Hardwick,		1			7.50	3.75	3.75	
Harmony,								
Hope,	1		12	12	11.00			\$11.00
Independence,								
Knowlton,	1	10	35	85	59.25			59.25
Mansfield,								
Pahaquarry,								
Washington,	1	1	5	50	8.50	2.63	2.63	3.25
White,								
Total,	4	12	77	\$172	\$111.25	\$18.87	\$18.88	\$73.50
State Total, ..	*292	*317	51,654	\$69,001	\$7,223.18	\$2,669.11	\$2,761.80	\$2,063.07

* These totals are greater than the actual number (583) because in 19 cases one fire burned in two or more townships.

† The sum of these columns often differs from the "Cost to Extinguish" item because a fine was larger than the bill, or a bill was withdrawn, etc.

VIOLATIONS OF LAW.

(See Table V.)

In the year just closed the known violations of the forest fire law have been fewer than in the year preceding. However, the proportion of known fires for which responsibility has been fixed upon the offender is higher. In 43% of the fires reported the person or agency through which the fire started has been held to account. In 65 additional cases violations of the permit law, from which no forest fire resulted, were fixed. The total number of cases in which the offenders were apprehended has been 320. Of these, 58% are chargeable to the railroads and 42% to the agencies as follows: 109 cases to brush burning, 7 to smokers, 14 to miscellaneous causes. Of these cases 69% has been finally disposed of. Of the 100 cases still pending 58 are for railroad fires, the settlement on which should be complete before January 1, and but 25 of those from other causes should be still pending with the opening of the new calendar year.

Of the residue of 90 unsettled cases from previous years 10 only remain pending. The penalties collected during the year have amounted to \$1,724.57. Of this total \$1,047.22 was paid by the railroads and \$677.35 by other agencies. The policy of rigid enforcement of the law persisted in is, perhaps, slowly but quite surely telling on the fire prevention problem. The persistent endeavor to use the administration of the law as a corrective, not a punitive, agent has continued to augment local support of the Fire Service. It has also emphasized anew the unflinching purpose to curtail the annual forest fire loss by strict insistence on greater care in the use of fire where necessary and the curtailment of its use where not needed.



Fig. 31. Logging Slash Like this Invites Fire to Start and Makes It impossible to Control.



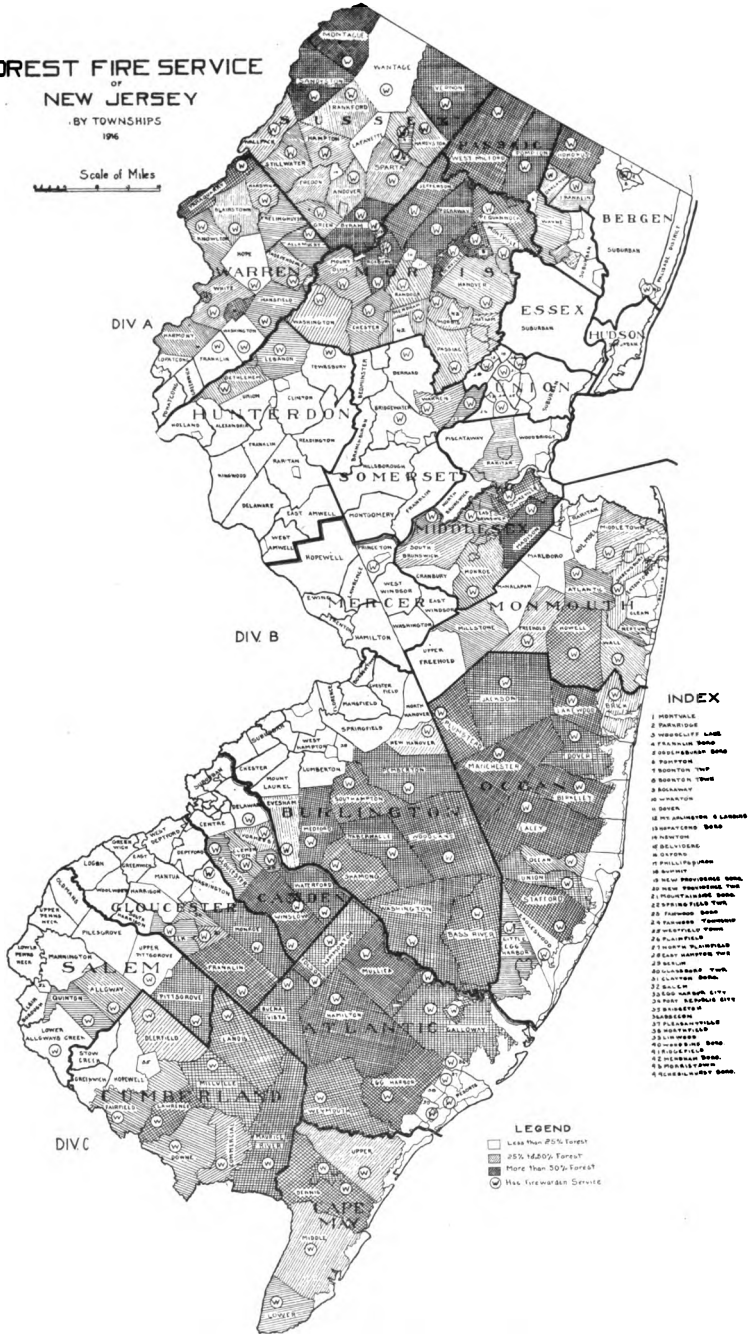
Fig. 32. Locomotives Like this Cannot Be Used in or Near the Forest Without Starting Fires. Oil-burners Would be Harmless.



**Fig. 33. Forest Completely Killed by Fire and Nothing to Begin a New Growth From.
CAUSE AND EFFECT.**

FOREST FIRE SERVICE OF NEW JERSEY BY TOWNSHIPS 1946

Scale of Miles
0 1 2 3 4



FIREWARDEN'S REPORT.

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TABLE V.—VIOLATIONS OF THE FOREST FIRE LAW, 1916.

DATE.	COUNTY AND TOWNSHIP.	OFFENDER.	OFFENSE.	SETTLEMENT.
April 7, 1916, . . .	Atlantic County— Buena Vista, . . . Buena Vista, . . .	W. M. Haddad, . . .	Allowed brush fire to escape, . . .	Paid fine, \$6.00.
May 10, . . .		Frank Pagugni, . . .	Set fire without a permit and allowed it to escape, . . .	Released with warning.
May 13, . . .		Bertolomeo Pellegrino, . . .	Set fire without a permit, . . .	Paid fine, \$5.00.
		Atlantic City R. R., . . .	3 fires set by locomotives, . . .	Paid firewardens' bills, \$5.25.
		Atlantic City R. R., . . .	1 fire set by locomotive, . . .	Pending.
		Pennsylvania R. R., . . .	2 fires set by locomotives, . . .	Paid firewardens' bills, \$10.75.
		Pennsylvania R. R., . . .	1 fire set by locomotive, . . .	Withdrawn.
		Erie R. R., . . .	1 fire set by locomotive, . . .	Paid firewarden's bill, \$6.00.
April 11, . . .	Egg Harbor, . . .	W. C. Burrell, . . .	Set fire by careless smoking, . . .	Paid fine, \$5.00.
May 3, . . .	Galloway, . . .	Atlantic City R. R., . . .	1 fire set by locomotive, . . .	Case dropped; township bill too tardy.
		C. A. Rensnyder, . . .	Set fire without a permit and allowed it to escape, . . .	Pending.
		Atlantic City, R. R., . . .	2 fires set by locomotives, . . .	Paid firewardens' bills, \$10.00.
			1 fire set by locomotive, . . .	Pending.
			1 fire set by locomotive, . . .	Case dropped; township bill too tardy.
			9 fires set by locomotives, . . .	Paid firewardens' bills, \$37.00.
October 10, . . .	Hamilton, . . .	Pennsylvania R. R., . . .	Set camp fire without a permit, . . .	Paid fine, \$2.00 each.
October 11, . . .	Hamilton, . . .	John M. Harley and Leon Davis, . . .	Set camp fire without a permit, . . .	Pending.
		Jos. M. Cooper and party of six, . . .	Set camp fire without a permit, . . .	Dropped; offender fled jurisdiction.
		Ernest Rufer, . . .	Set camp fire without a permit, . . .	Pending.
		Philip Gruo and John Tell, . . .	Set camp fire without a permit, . . .	Pending.
		H. G. Baker and party of fourteen, . . .	Set camp fire without a permit, . . .	Pending.
October 18, . . .	Hamilton, . . .	Jacob Brodeck and party of fourteen, . . .	Set camp fire without a permit, . . .	Pending.
		Pennsylvania R. R., . . .	Set camp fire without a permit, . . .	Pending.
		Pennsylvania R. R., . . .	1 fire set by locomotive, . . .	Paid firewarden's bill, \$12.50.
		Pennsylvania R. R., . . .	1 fire set by locomotive, . . .	Case dropped; township bill too tardy.
April 4, . . .	Hammonton, . . .	Nick Pegano and Frank Emery, . . .	Set fire without a permit, . . .	Pending.
May 2, . . .	Hammonton and Mullica, . . .	Philip Delalio, . . .	Allowed brush fire to escape, . . .	Pending.
May 19, . . .	Hammonton, . . .	Chas. Gazzara, . . .	Set fire by careless smoking, . . .	Released; secured withdrawal of bill from firefighters.
October 12, . . .	Hammonton, . . .	Gerard Rubertone, . . .	Set fire without a permit and allowed it to escape, . . .	Pending.
October 26, . . .	Hammonton, . . .	Raymond Decamp and party of two, . . .	Set camp fire without a permit, . . .	Pending.
		Atlantic City R. R., . . .	3 fires set by locomotives, . . .	Paid firewardens' bills, \$7.00.
		Atlantic City R. R., . . .	2 fires set by locomotives, . . .	Pending.
		New Jersey Central R. R., . . .	1 fire set by locomotive, . . .	Paid firewarden's bill, \$14.00.
		Pennsylvania R. R., . . .	4 fires set by locomotives, . . .	Paid firewarden's bill, \$15.00.

TABLE V.—VIOLATIONS OF THE FOREST FIRE LAW, 1916—Continued.

DATE.	COUNTY AND TOWNSHIP.	OFFENDER.	OFFENSE.	SETTLEMENT.
Atlantic County—Con.				
July 7,	Mullica,	Eugene Tarson,	Set fire without a permit and allowed it to escape,	Arrested, prosecuted, convicted and jailed until \$50.00 fine paid.
September 14,	Mullica,	F. Brooks, Atlantic City R. R., Atlantic City R. R., Pennsylvania R. R., Pennsylvania R. R., Pennsylvania R. R., Mr. Strough and Mr. Wells,	Set fire by careless smoking, 3 fires set by locomotives, 1 fire set by locomotive, 3 fires set by locomotives, 2 fires set by locomotives, 1 fire set by locomotive, Sons set fire without a permit and allowed it to escape, Set fire without a permit and allowed it to escape,	Pending. Paid firewardens' bills, \$30.75. Pending. Paid firewardens' bills \$8.50. Pending. Case dropped; township bill too tardy. Released with warning.
March 19,	Weymouth,	C. Seelman,	Set fire without a permit and allowed it to escape,	Released with warning.
May 3,	Weymouth,	Atlantic Construction and Supply Co.,	Locomotive set forest fire,	Dropped; insufficient evidence.
May 3-4,	Weymouth,	Atlantic Construction and Supply Co.,	Locomotive set forest fire,	Paid bill, \$44.10.
May 22,	Weymouth,	Bethlehem Steel Co., Atlantic City R. R., Atlantic City R. R.,	Employees allowed brush fire to escape, Employees carelessly set forest fire, 1 fire set by locomotive, 1 fire set by locomotive,	Paid bill, \$16.50. Pending. Paid firewarden's bill, \$14.00. Case dropped; township bill too tardy.
October 17,	Weymouth,	Atlantic City R. R.,	1 fire set by locomotive,	Case dropped; township bill too tardy.
Bergen County—				
May 6,	Oakland,	N. J. Artesian Well Drilling Co., New York, Susquehanna and Western R. R.,	Traction engine set forest fire, 3 fires set by locomotives,	Paid bill, \$6.00. Pending.
Burlington County—				
October 29,	Bas River,	Hembert Demichilis,	Set fire without a permit and allowed it to escape,	Pending.
April 21,	Medford,	Thos. Strain,	Allowed brush fire to escape,	Pending.
January 26,	Pemberton,	J. L. Hudders,	Set fire without a permit,	Paid fine, \$5.00.
March 25,	Pemberton,	Geo. Eckman,	Set fire without a permit,	Paid fine, \$5.00.
March 27,	Pemberton,	Ezekiel Sooy,	Set fire without a permit,	Paid fine, \$5.00.
March 27,	Pemberton,	James B. Riley,	Set fire without a permit,	Paid fine, \$5.00.
March 27,	Pemberton,	Samuel Brown,	Set fire without a permit,	Paid fine, \$5.00.
March 27,	Pemberton,	Pennsylvania R. R.,	4 fires set by locomotives, 3 fires set by locomotives,	Paid firewardens' bills, \$18.25. Pending.

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TABLE V.—VIOLATIONS OF THE FOREST FIRE LAW, 1916—Continued.

DATE.	COUNTY AND TOWNSHIP.	OFFENDER.	OFFENSE.	SETTLEMENT.
April 11,	Tabernacle, Shamong,	Thos. Ackerson,	Set fire without a permit and allowed it to escape,	Dropped; insufficient evidence.
	Southampton & Medford,	New Jersey Central R. R.,	2 fires set by locomotives,	Paid firewardens' bills, \$14.00.
	Shamong,	New Jersey Central R. R.,	3 fires set by locomotives,	Pending.
August 20,	Tabernacle,	New Jersey Central R. R.,	1 fire set by locomotive,	Paid firewarden's bill, \$10.60.
September 5,	Woodland,	Browns Mills Cranberry Co.,	Allowed brush fire to escape,	Pending.
	Woodland,	Browns Mills Cranberry Co.,	Allowed brush fire to escape,	Pending.
Camden County—				
April 16,	Clementon,	C. C. Howard Club,	Set fire without a permit,	Released with warning.
May 7,	Clementon,	Mrs. Sarah Nevius,	Children set fire without a permit,	Released with warning.
April 20,	Gloucester,	Henry A. Delano,	Set fire without a permit and allowed it to escape,	Paid firewardens' bills, \$22.00.
May 22,	Gloucester,	I. A. Ball,	Set fire without a permit,	Pending.
March 28,	Voorhees,	Peter Pierson,	Set fire without a permit,	Paid fine, \$25.00.
January 1,	Winslow,	Ellis Jones,	Set fire without a permit,	Released with warning.
March 21,	Winslow,	Peter Esposto,	Set fire without a permit,	Dropped; insufficient evidence.
March 27,	Winslow,	Antonio Lanzaro,	Set fire without a permit,	Paid fine, \$5.00.
March 28,	Winslow,	Leonard Rassedivito,	Allowed brush fire to escape,	Paid fine, \$5.00.
April 20,	Winslow,	Marriam Pernice,	Allowed brush fire to escape,	Paid fine, \$20.00.
May 1,	Winslow,	John Bailey,	Set fire without a permit,	Paid fine, \$5.00.
May 21,	Winslow,	Carl Hildebrandt,	Son set fire without a permit and allowed it to escape,	Pending.
	Winslow,	Atlantic City R. R.,	Set fire without a permit,	Paid fine, \$10.00.
	Winslow,	Atlantic City R. R.,	8 fires set by locomotives,	Paid firewardens' bills, \$161.75.
	Winslow,	Atlantic City R. R.,	5 fires set by locomotives,	Case dropped; township bill too tardy.
	Winslow,	Atlantic City R. R.,	1 fire set by locomotive,	Pending.
	Winslow,	New Jersey Central R. R.,	1 fire set by locomotive,	Pending.
	Winslow,	Pennsylvania R. R.,	2 fires set by locomotives,	Paid firewardens' bills, \$17.85.
Cape May County—				
	Dennis,	Atlantic City R. R.,	3 fires set by locomotives,	Paid firewarden's bill, \$19.00.
	Dennis,	Atlantic City R. R.,	1 fire set by locomotive,	Case dropped; township bill too tardy.
	Dennis,	Pennsylvania R. R.,	1 fire set by locomotive,	Pending.
	Dennis,	Pennsylvania R. R.,	1 fire set by locomotive,	Case dropped; township bill too tardy.
	Dennis,	Pennsylvania R. R.,	1 fire set by locomotive,	Case dropped; township bill too tardy.
	Dennis,	Pennsylvania R. R.,	2 fires set by locomotives,	Paid firewarden's bill, \$7.00.
	Dennis,	Pennsylvania R. R.,	1 fire set by locomotive,	Paid firewarden's bill, \$8.00.
	Dennis,	Pennsylvania R. R.,	1 fire set by locomotive,	Paid firewarden's bill, \$12.00.
	Dennis,	Pennsylvania R. R.,	1 fire set by locomotive,	Pending.

TABLE V.—VIOLATIONS OF THE FOREST FIRE LAW, 1916—Continued.

DATE.	COUNTY AND TOWNSHIP.	OFFENDER.	OFFENSE.	SETTLEMENT.
September 28, ...	Cumberland County— Deerfield, ... Downe, ... Downe, ... Fairfield, ... Landis, ... Landis, ... Landis, ... Landis, ... Landis, ... Landis, ... Landis, ... Landis, ... Landis, ... Landis, ... Landis, ... Landis, ... Landis, ... Maurice River, ...	H. Silverman, ...	Set fire without a permit and allowed it to escape, ...	Pending.
August 9, ...		W. H. Robbins, ...	Set fire without a permit, ...	Paid fine, \$5.00.
July 7, ...		New Jersey Central R. R., ...	Set fire set by locomotive, ...	Pending.
April 1, ...		Francis Cuff, ...	Set fire without a permit and allowed it to escape, ...	Released with warning.
April 5, ...		Salvatore Paterno, ...	Set fire without a permit, ...	Released with warning.
April 24, ...		E. H. Linker, ...	Set fire without a permit, ...	Released with warning.
May 9, ...		W. Zimmer, ...	Set fire without a permit and allowed it to escape, ...	Pending.
May 10, ...		Alfred Sheer, ...	Set fire without a permit and allowed it to escape, ...	Paid fine, \$10.00.
May 21, ...		Elwood Ford, ...	Set fire without a permit and allowed it to escape, ...	Pending.
August 3, ...		C. G. Bora, ...	Set fire without a permit, ...	Paid fine, \$25.00.
August 15, ...		Antonio Fiamengo, ...	Set fire without a permit, ...	Pending.
November 9, ...		John Sheppard, ...	Set fire without a permit, ...	Pending.
		Pennsylvania R. R., ...	4 fires set by locomotives, ...	Case dropped; township bill too tardy.
		J. W. Sutton, State Prison Farm Supt., ...	Allowed brush fire to escape, ...	Dropped on request of State Board of Prison Inspectors with assurance against repetition.
May 10, ...		Amphy Hysen, ...	Grandson set fire without a permit, ...	Released with warning.
May 11, ...		Geo. Esibell, ...	Set an illegal back fire, ...	Paid fine, \$50.00.
October 18, ...		Harry S. Parker and party of thirteen, ...	Set camp fire without a permit, ...	Pending.
April 14, ...		Jacob Mann, ...	Set fire without a permit, ...	Pending.
May 10-11, ...		Milton and Howard Caynter and Bennie Sharpless, ...	Maliciously set fire, ...	Arrested, remanded by Justice Court to Juvenile Court, convicted and paroled on probation for three years.
October 9, ...	Millville, ...	Henry Raymond, ...	Allowed brush fire to escape, ...	Pending.
	Millville, ...	Pennsylvania R. R., ...	2 fires set by locomotives, ...	Paid firewardens' bills, \$22.50.

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TABLE V.—VIOLATIONS OF THE FOREST FIRE LAW, 1916—Continued.

DATE.	COUNTY AND TOWNSHIP.	OFFENDER.	OFFENSE.	SETTLEMENT.
6	Gloucester County—			
April 13,	Elk,	Pennsylvania R. R.,	1 fire set by locomotive,	Paid firewarden's bill, \$9.00.
April 13,	Franklin,	Mike Miscarello,	Sons set fire without a permit,	Paid fine, \$5.00.
April 13,	Franklin,	Peter Colucci,	Set fire without a permit,	Paid fine, \$5.00.
April 19,	Franklin,	Tony Travaglino,	Set fire without a permit and allowed it to escape,	Paid fine, \$10.00.
May 4,	Franklin,	James Nichols,	Set fire without a permit and allowed it to escape,	Paid fine, \$15.00.
March 1,	Monroe,	Mrs. Fred Schour and Mrs. Stephen Rumpf,	Children set fire without a permit and allowed it to escape,	Released with warning.
March 31,	Monroe,	Michael Stadnick,	Set fire by careless smoking,	Paid fine, \$10.00.
April 16,	Monroe,	John Estroy,	Set fire without a permit and allowed it to escape,	Arrested, tried, plead guilty, fined \$50.00 and sentenced to 30 days' imprisonment in lieu of fine.
April 21,	Monroe,	Maurice V. Warner,	Set fire without a permit and allowed it to escape,	Paid fine, \$5.00.
April 29,	Monroe,	John Knostic,	Set fire without a permit and allowed it to escape,	Paid fine, \$5.00.
May 9,	Monroe,	John Knostic,	Set fire without a permit,	Dropped; insufficient evidence.
May 9,	Monroe,	John Aokaty,	Set fire without a permit,	Paid fine, \$5.00.
May 11,	Monroe,	Samuel Lavinsky,	Set fire without a permit and allowed it to escape,	Pending.
May 13,	Monroe,	John Slobzden,	Set fire without a permit,	Paid fine, \$5.00.
	Monroe,	Atlantic City R. R.,	1 fire set by locomotive,	Paid firewarden's bill, \$15.00.
	Monroe,	New Jersey Central R. R.,	1 fire set by locomotive,	Pending.
	Mercer County—			
April 21,	Princeton,	G. W. Silvester,	Set fire without a permit,	Paid fine, \$5.00.
	Middlesex County—			
July 27,	Monroe,	Richard J. Drever, Supt. N. J. State Home for Boys, Jamesburg, N. J.,	Set fire without a permit,	Released with warning.
	Sayreville,	Raritan River R. R.,	1 fire set by locomotive,	Case dropped; township bill too tardy.
	Monmouth County—			
	Atlantic,	New Jersey Central R. R.,	1 fire set by locomotive,	Paid firewarden's bill, \$14.00.
	Atlantic,	New Jersey Central R. R.,	1 fire set by locomotive,	Pending.
December 3,	Howell,	J. H. Brocklebank,	Set fire without a permit,	Paid fine, \$5.00.

TABLE V.—VIOLATIONS OF THE FOREST FIRE LAW, 1916—Continued.

DATE.	COUNTY AND TOWNSHIP.	OFFENDER.	OFFENSE.	SETTLEMENT.
May 6,	Howell and Wall,	Bennett Gravel Co.,	Locomotive set fire,	Paid bill, \$5.05.
May 8,	Howell and Wall,	Bennett Gravel Co.,	Locomotive set fire,	Paid bill, \$2.00.
	Howell,	New Jersey Central R. R.,	4 fires set by locomotives,	Paid firewardens' bills, \$17.40.
	Shrewsbury,	New Jersey Central R. R.,	1 fire set by locomotive,	Pending.
	Shrewsbury,	New Jersey Central R. R.,	1 fire set by locomotive,	Paid firewarden's bill, \$4.00.
	Shrewsbury,	New Jersey Central R. R.,	2 fires set by locomotives,	Dropped, bills too tardy.
Morris County—				
October 30,	Boonton,	A. O. Miller,	Set fire without a permit,	Pending.
	Chestnut,	D. L. and W. R. R.,	2 fires set by locomotive,	Paid firewardens' bills, \$16.00.
	Denville,	D. L. and W. R. R.,	1 fire set by locomotive,	Paid firewardens' bills, \$3.00.
May 20,	Hanover,	Chas. T. Eastburn Co.,	Set fire without a permit,	Pending.
August 25,	Jefferson,	H. Y. Coffey,	Set fire without a permit,	Released with warning.
April 11,	Montville,	C. C. Vreeland,	Set fire by careless smoking,	Paid fine, \$5.00.
January 14,	Morris,	W. H. Howell,	Employees set fire without a permit,	Released with warning.
July 6,	Morris,	Carpenter and Knight,	Set fire without a permit,	Released with warning.
October 1,	Morris,	Leon L. Coffey,	Set fire without a permit,	Pending.
October 10,	Morris,	Carpenter & Knight,	Set fire without a permit,	Pending.
October 3,	Mt. Olive,	Ralph E. Beers,	Set fire without a permit,	Released with warning.
	Pequannock,	N. Y., S. & W. R. R.,	4 fires set by locomotives,	Pending.
	Randolph,	N. Y., S. & W. R. R.,	1 fire set by locomotive,	Dropped.
	Rockaway,	N. J. C. R. R.,	1 fire set by locomotive,	Paid firewarden's bill, \$12.00.
	Rockaway,	W. & N. R. R.,	1 fire set by locomotive,	Paid firewarden's bill, \$10.00.
	Roxbury,	W. & N. R. R.,	1 fire set by locomotive,	Case dropped; township bill too tardy.
	Roxbury,	Atlas Powder Co.,	Employees set forest fire,	Paid bill, \$2.50.
	Roxbury,	D. L. and W. R. R.,	1 fire set by locomotive,	Paid firewarden's bill, \$1.40.
	Roxbury,	D. L. and W. R. R.,	1 fire set by locomotive,	Case dropped; township bill too tardy.
	Roxbury,	New Jersey Central R. R.,	1 fire set by locomotive,	Paid firewarden's bill, \$2.00.
Ocean County—				
May 31,	Berkeley,	N. D. Yale,	Set fire without a permit,	Paid fine, \$5.00.
September 2,	Berkeley,	M. D. Coleman,	Set fire without a permit,	Pending.
	Berkeley,	N. J. Central R. R.,	2 fires set by locomotives,	Paid firewarden's bill, \$110.62.
	Berkeley,	N. J. Central R. R.,	1 fire set by locomotive,	Case dropped; township bill too tardy.
May,	Dover,	Wm. J. Miller,	Set fire without a permit,	Paid fine, \$5.00.
	Dover,	N. J. C. R. R.,	2 fires set by locomotives,	Paid fine, \$5.00.
	Dover,	Russell Voorhees,	Set fire without a permit,	Paid firewarden's bill, \$8.00.
April,	Jackson,	Luke Brannin,	Set fire without a permit,	Paid fine, \$15.00.
April,	Jackson,	Wm. Clayton,	Set fire without a permit,	Paid fine, \$5.00.
April,	Jackson,	Wm. Clayton,	Set fire without a permit,	Paid fine, \$5.00.
April,	Jackson,	Ray Hendrickson,	Set fire without a permit,	Paid fine, \$5.00.
April,	Jackson,	A. Okonsky,	Set fire without a permit,	Pending.

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TABLE V.—VIOLATIONS OF THE FOREST FIRE LAW, 1916—Continued.

DATE.	COUNTY AND TOWNSHIP.	OFFENDER.	OFFENSE.	SETTLEMENT.
May 2,	Jackson,	Commodore Cottrell,	Set fire without a permit,	Pending.
June 2,	Lacey,	Cedar Crest Orchard and Produce Co.,	Allowed brush fire to escape,	Pending.
June 2,	Lacey,	Oscar Downs,	Set illegal back fire,	Pending.
October 25,	Lacey,	Fred M. Estell and party of five,	Set camp fire without a permit,	Pending.
November 4,	Lacey,	N. J. Central R. R.,	1 fire set by locomotive,	Paid firewarden's bill, \$53.25.
April 1,	Lakewood,	N. J. Central R. R.,	1 fire set by locomotive,	Pending.
April 3,	Lakewood,	E. W. Holman,	Set fire without a permit,	Released with warning.
April 3,	Lakewood,	Enoch Walton,	Set fire without a permit,	Paid fine, \$3.00.
April 3,	Lakewood,	Dr. W. F. Brown,	Employees set fire without a permit,	Paid fine, \$3.00.
April 6,	Lakewood,	Albert Patterson,	Set fire without a permit,	Paid fine, \$3.00.
April 11,	Lakewood,	Oscar Olson,	Set fire without a permit,	Pending.
April 24,	Lakewood,	A. L. White,	Allowed brush fire to escape,	Paid fine, \$3.00.
April 24,	Lakewood,	N. J. Central R. R.,	1 fire set by locomotive,	Pending.
January 1,	Manchester,	Albert A. Le Roy,	Employees set fire without a permit,	Released with warning.
March 27,	Manchester,	Chas. Giberson,	Set fire without a permit,	Paid fine, \$3.00.
May 4,	Manchester,	John Bell,	Set fire without a permit and allowed it to escape,	Pending.
August 6,	Manchester,	Harold J. Pettes and Victor Stukalo,	Set fire without a permit,	Pending.
April 21,	Manchester,	N. J. Central R. R.,	2 fires set by locomotives,	Paid firewardens' bills, \$8.00.
April 21,	Manchester,	N. J. Central R. R.,	4 fires set by locomotives,	Pending.
April 21,	Plumstead,	N. J. Central R. R.,	4 fires set by locomotives,	Case dropped; township bill too tardy.
April 21,	Plumstead,	Joshua Emery,	Set fire without a permit,	Paid fine, \$5.00.
June 22,	Passaic County— Pompton,	Harry Conklin,	Set camp fire without a permit and allowed it to escape,	Pending.
April 23,	West Milford,	Wm. E. Howard,	Set fire without a permit and allowed it to escape,	Paid fine, \$8.00.
April 23,	West Milford,	N. Y. S. & W. R. R.,	3 fires set by locomotives,	Paid firewardens' bills, \$6.00.
April 23,	West Milford,	N. Y. S. & W. R. R.,	5 fires set by locomotives,	Pending.
April 18,	Salem County— Lower Alloways Creek, ..	Edward Nichols,	Set fire without a permit and allowed it to escape,	Paid fine, \$16.00.
January 28,	Pittsgrove,	Paul Schman,	Allowed brush fire to escape,	Paid fine, \$15.00.
August 26,	Upper Pittsgrove,	John Keller,	Set fire without a permit,	Pending.

TABLE V.—VIOLATIONS OF THE FOREST FIRE LAW, 1916—Continued.

DATE.	COUNTY AND TOWNSHIP.	OFFENDER.	OFFENSE.	SETTLEMENT.
May 12,	Somerset County—			
May 12,	Bernard,	Mike Bellay and Steve Hon- oshosky,	Set fire without a permit and al- lowed it to escape,	Paid fine, \$3.00 each. Released with warning.
May 22,	Bernard,	Geo. L. Achen,	Set fire without a permit,	
March 31,	Bridgewater,	Fred Beckman,	Set fire without a permit and al- lowed it to escape,	Paid fine, \$10.00. Pending.
October 26,	Warren,	Mrs. Jos. Paggio,	Set fire without a permit,	
May 12,	Sussex County—			
May 12,	Byram,	Mrs. Whitfield Riker,	Set fire without a permit and al- lowed it to escape,	Released with warning. Paid firewarden's bill, \$15.00.
May 12,	Byram,	D. L. and W. R. R.,	3 fires set by locomotives,	
May 12,	Hampton,	Leslie E. Van Stone,	Set fire without a permit and al- lowed it to escape,	Paid fine, \$12.00. Paid firewarden's bill, \$4.00. Pending.
October 17,	Hardyston,	N. Y., S. and W. R. R.,	1 fire set by locomotive,	
October 17,	Hardyston,	N. Y., S. and W. R. R.,	3 fires set by locomotives,	
October 17,	Sandyston,	Geo. Losey,	Set fire without a permit and al- lowed it to escape,	Pending. Pending.
October 17,	Sparta,	N. Y., S. and W. R. R.,	1 fire set by locomotive,	
November 2,	Union County—			
November 2,	Fanwood Boro,	Mrs. Theo. Hargraves,	Allowed brush fire to escape,	Paid fine, \$7.00.
May 11,	Warren County—			
May 11,	Hope,	John Hesein,	Set fire without a permit and al- lowed it to escape,	Pending. Paid firewarden's bill, \$23.00. Paid firewarden's bill, \$3.00. Pending.
May 11,	Knowlton,	D., L. and W. R. R.,	1 fire set by locomotive,	
May 11,	Knowlton,	N. Y., S. and W. R. R.,	1 fire set by locomotive,	
May 11,	Knowlton,	N. Y., S. and W. R. R.,	8 fires set by locomotives,	
May 11,	Knowlton,	L. and N. E. R. R.,	1 fire set by locomotive,	Paid firewarden's bill, \$1.00. Paid firewarden's bill, \$2.25.
May 11,	Washington,	D., L. and W. R. R.,	1 fire set by locomotive,	

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